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Heavy Metal Contamination

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Discovering Thoughts, Inventing Future

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Assessment of Groundwater Pollution using Geophysical Norms and GIS as a Tool, a Case Study of Part of Ikeja, Lagos State, Nigeria, West Africa

By Omogunloye Olusola Gabriel & Jimoh Rafiu Atanda
University of Lagos, Nigeria

Abstract- GIS and Electrical resistivity method of geophysical methods has been combined for the assessment of groundwater potential in Ikeja Local Government of Lagos State, Nigeria. Ten (10) vertical electrical sounding was carried out using the High resolution Abem Terrameter Sas 4000 Earth resistivity Meter.Curve matching techniques and WinResist software were used to process and iterate VES data; AutoCAD 2012 version was used to draw the geoelectric section using the depth of each lithology and was then imported into the ArcGIS to perform several queries.

Keywords: geophysical norms, groundwater pollution, electrical resistivity method, vertical electrical sounding, GIS.

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Assessment of Groundwater Pollution using Geophysical Norms and GIS as a Tool, a Case Study of Part of Ikeja, Lagos State, Nigeria, West Africa

Omogunloye Olusola Gabriel [α] & Jimoh Rafiu Atanda [ρ]

Abstract- GIS and Electrical resistivity method of geophysical methods has been combined for the assessment of groundwater potential in Ikeja Local Government of Lagos State, Nigeria. Ten (10) vertical electrical sounding was carried out using the High resolution Abem Terrameter Sas 4000 Earth resistivity Meter.Curve matching techniques and WinResist software were used to process and iterate VES data; AutoCAD 2012 version was used to draw the geoelectric section using the depth of each lithology and was then imported into the ArcGIS to perform several queries.

The study area is situated in Ikeja, Lagos state and falls within the south-western Nigeria. The groundwater regime of the selected location has been delineated into Good quality fresh water, Good quality water, Intermediate quality fresh water, and Poor quality fresh water. The resistivity of the vertical electrical sounding carried out in the study area varies from 15.6Ωm to 1440Ωm. Fourteen(14) Geoelectric layers were delineated from the study area includes the Topsoil, Sand, Clayey sand, Coarse sand, Sandy clay, Clay, Clay/sand intercalation, gravelly sand, sand stone, silty clay, fine sand, clay with intercalations of thin sand layer, and coarse sand/sandstone. The pollution plume was noticed in VES1, 4, 5 and 9 and the effect was more pronounced in VES 9 because of the leachate effect from Olushosun Landfill characterized with sand having resistivity range from 27Ωm to 30Ωm.This signify that the groundwater has been polluted at the surface.

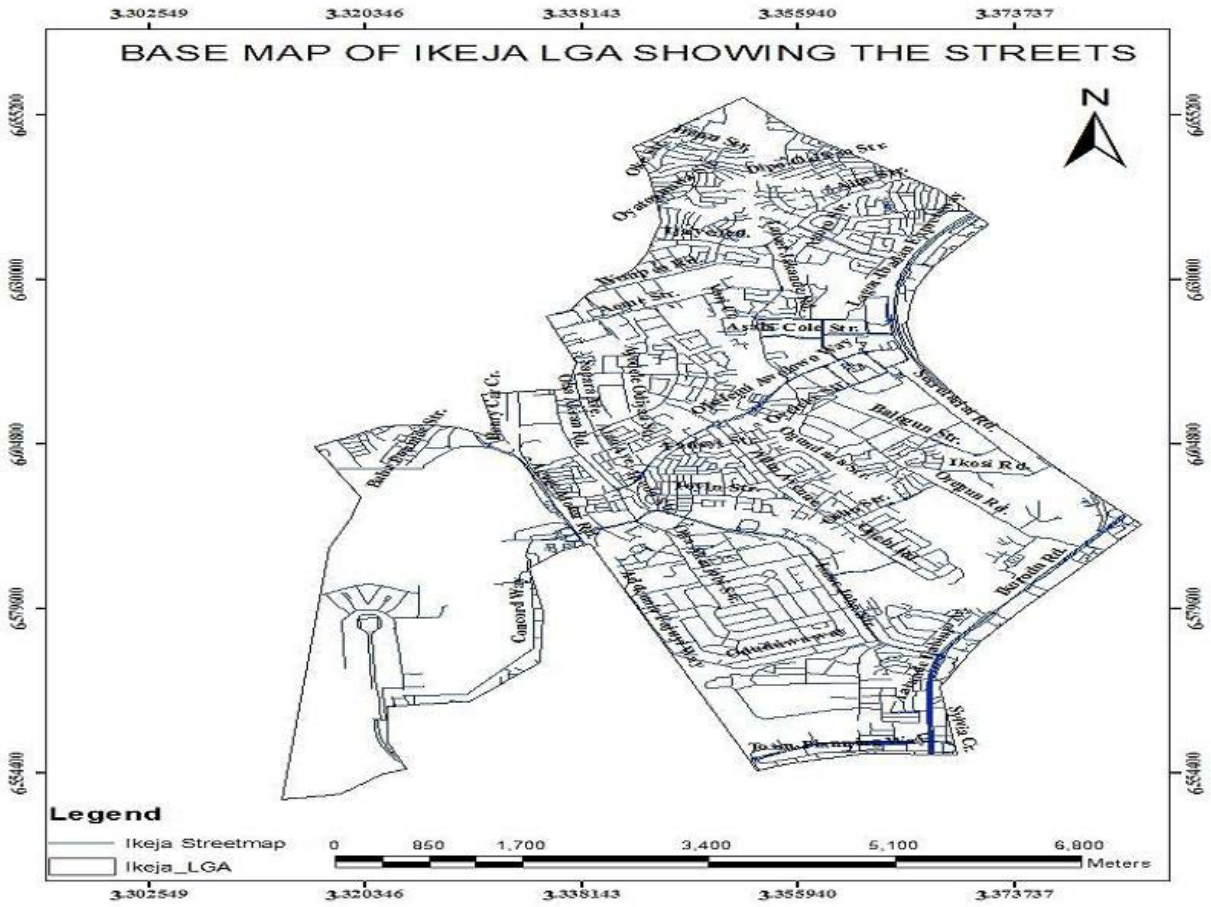
Keywords: geophysical norms, groundwater pollution, electrical resistivity method, vertical electrical sounding, GIS.

I. Introduction

GIS is any computerized tools that can be used for analysing, managing, editing, Manipulating, retrieving, converting, storing and output of a Geographic data which are spatially georeferenced in the air. It has been found to be a veritable and effective tool in the management of database for groundwater pollution assessment. Surface resistivity methods have been employed successfully for detecting and mapping ground water contamination under a variety of conditions. The method is based on the fact that formation resistivity depends on the conductivity of the pore fluid as well as the properties of the porous medium. Integrating the GIS and resistivity techniques has been proved to be an efficient tool in groundwater pollution studies. Under favourable conditions, contrasts in resistivity may be attributed to mineralized ground water with a higher than normal specific conductance originating at a contamination source. Success has been reported in tracing water from landfills (Cartwright and McComas, 1968; Cartwright and Sherman, 1972; Stollar and Roux, 1975), sewage treatment effluent (Fink and Aulenbach, 1974), salt piles (Fried and Ungemach, 1971).The lithologies of the study area consist of the recent sediment, coastal plain sand, ewekoro formation, and Abeokuta formation which directly overlie the basement complex. Groundwater is a major source of water supply in Lagos state despite the provision of potable water through the state government micro water works to the people of Ikeja, the populace still depends on wells (shallow and deep) for their domestic water supply. The suitability of groundwater for drinking especially in areas close to the landfill in the study area has continued to raise a source of concern due to the possibility of contamination which pose a major environmental and health concern. Figure 1 and Figure 2 shows the Basemap and locations of the geoelectric survey points carried out for this research work respectively.

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BASE MAP OF IKEJA LGA SHOWING THE STREETS
N
3.302549
3.320346
3.338143
3.355940
3.373737
6655200
6630000
6604800
6579600
6554400
Legend
Ikeja Streetmap
Ikeja_LGA
0
850
1,700
3,400
5,100
6,800
Meters
Ikosi Rd.
Oregun Rd.
Ogudu Rd.
Ojota Ring Rd.
Agidi Cole Str.
Balogun Str.
Ojota Ave.
Ojuelegba Rd.
Ojuelegba Ave.
Ojuelegba Flyover Bridge

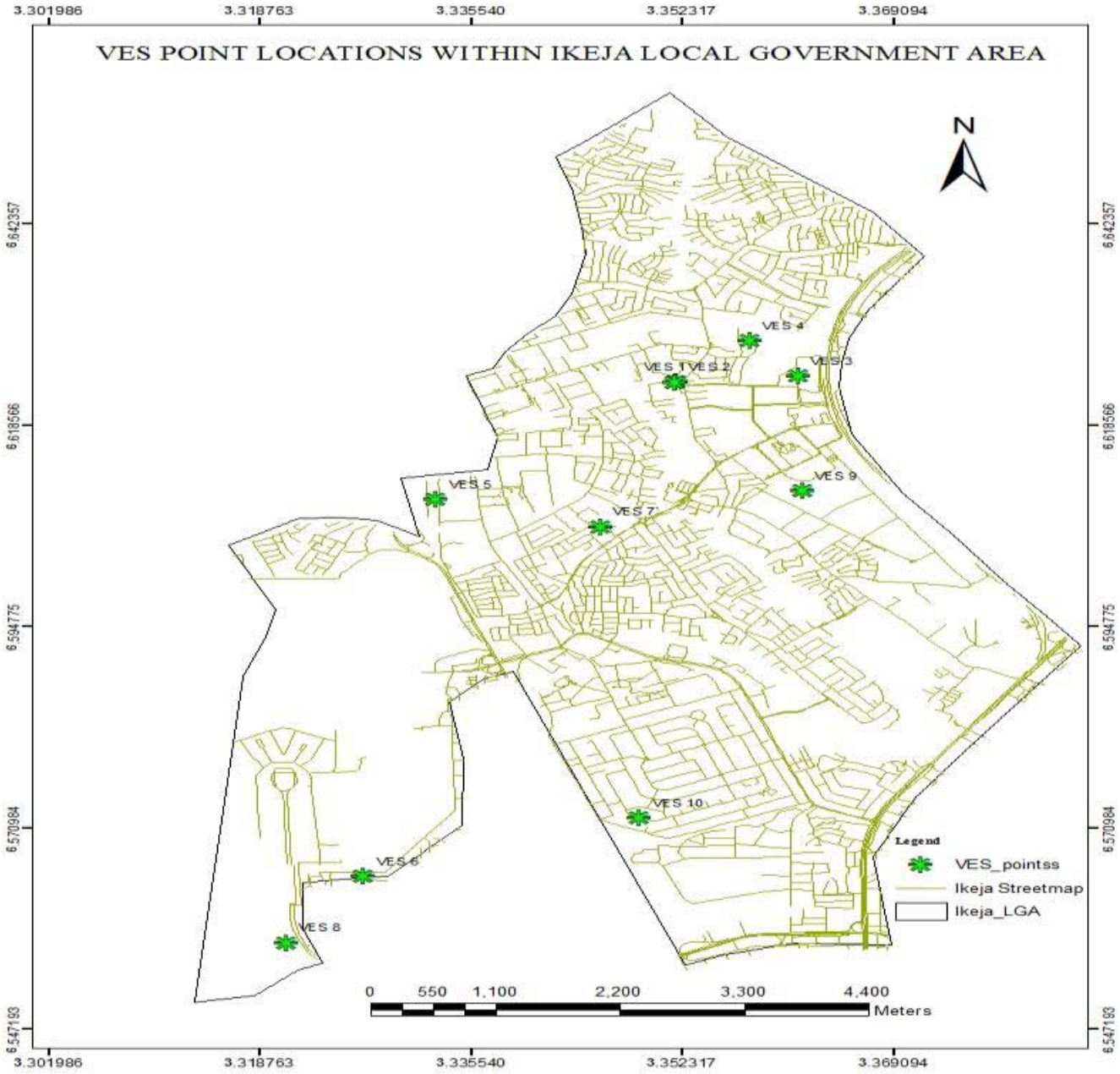


Figure 2 : Locations of the VES Points on the Map of Ikeja Local Government Area

II. Geology and Hydrogeology of the Study Area

The study area is located within the western part of Nigeria, a zone of coastal creek and Lagoon (Elueze, et al, 2004). The area is also developed by barrier beaches associated with sand deposits (Ogbe F.G.A, 1992).The study area (Ikeja) is geologically underlain by sediments of Dahomey Basin (Geology of Nigeria).The lithologies of this study area are grouped into Recent Sediments, Coastal Plain Sands, Ilaro Formation, Ewekoro formation and Abeokuta formation, which directly overlies the basement. Geologically, the study area is within the coastal plain sand **(Figure 3).**

Hydrogeologically, four major aquifers are recognized within the basin. The Surface aquifer is in the recent sediments, and two major aquifers are within the Coastal plain Sands. The most Prolific aquifer is within the Abeokuta formation.

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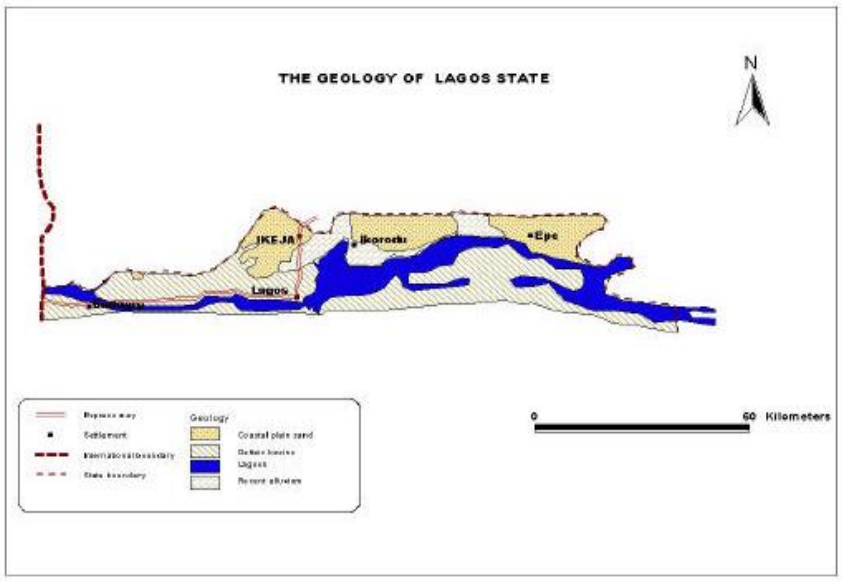


Figure 3 : The Geological Map of Lagos State showing Ikeja Local Government Area

III. Data Collection and Processing

Data Acquisition was done using a High resolution Abem terrameter Sas 4000 earth resistivity meter spread across part of the Local Government. The Schlumberger electrode configuration with maximum electrode configuration of 200m was adapted. The acquired resistivity data were processed and interpreted with WinResist iterative software that interprets 1D electrical resistivity sounding data and produce layered resistivity model that reveals subsurface geology. Figures (4-12) are the iterated curves with layered resistivity models of the data acquired at the VES stations. Several Spatial queries analysis were performed in ArcGIS software based on the resistivity data acquired on the field as shown in Figure(13-17).

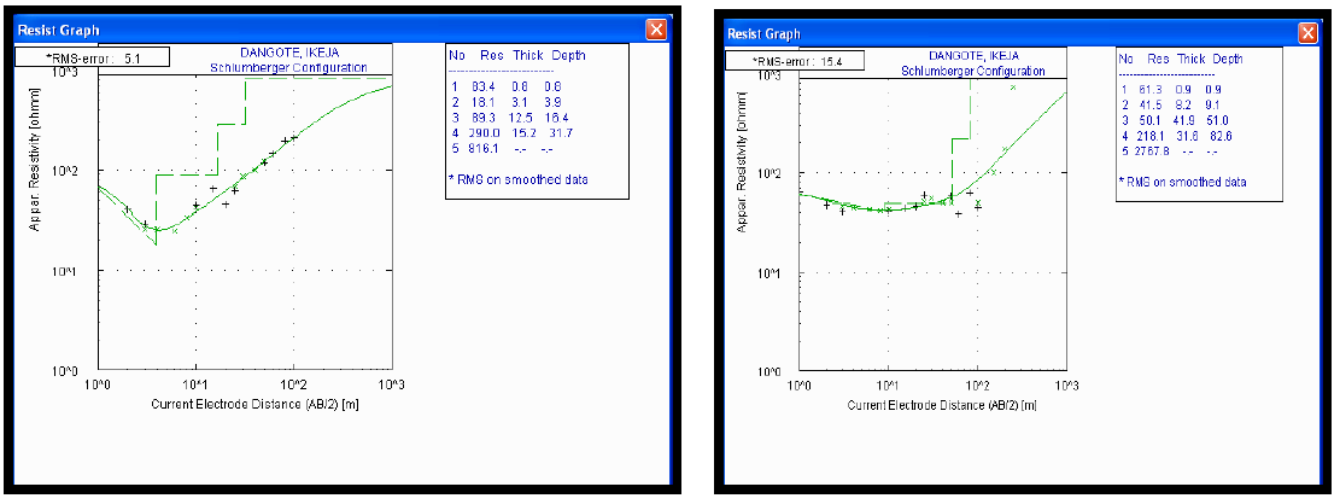


Figure 4 : The Schlumberger Depth Sounding curve beneath the surveyed area at Dangote,Ikeja

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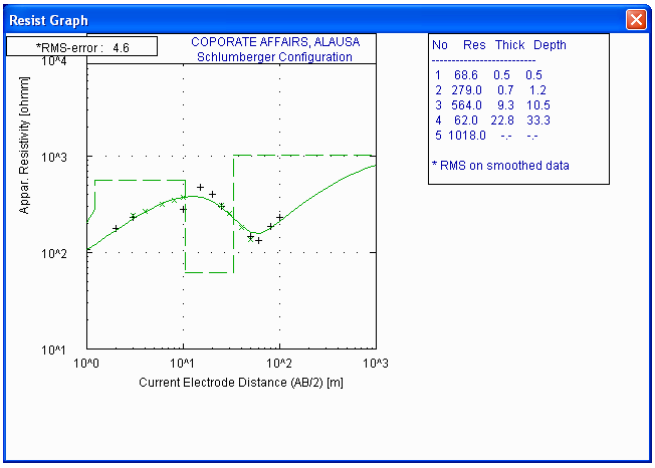


Figure 5 : The Schlumberger Depth Sounding curve beneath the surveyed area at coporate Affairs, Ikeja

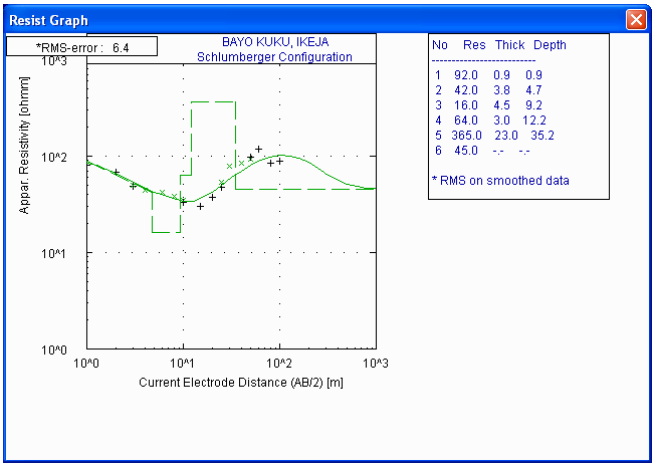


Figure 6 : The Schlumberger Depth Sounding curve beneath the surveyed area at Bayo Kuku, Ikeja

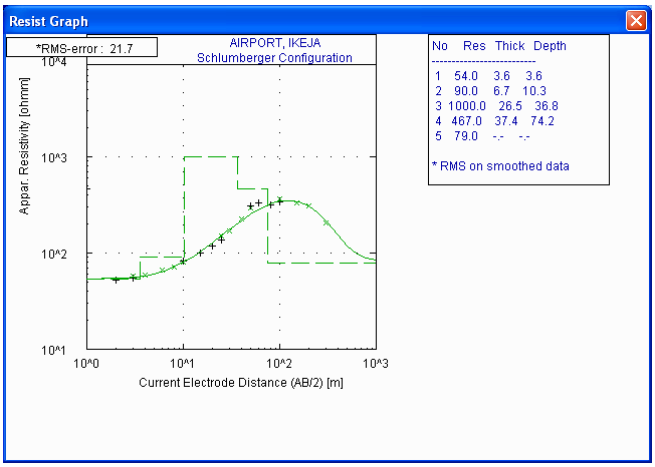


Figure 7 : The Schlumberger depth sounding curve beneath the surveyed area at Lagos Airport, Ikeja

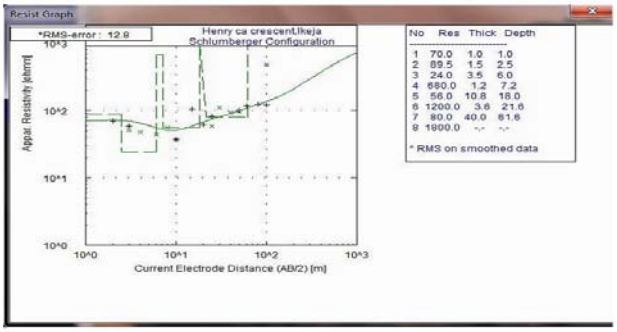


Figure 8 : The Schlumberger depth sounding curve beneath the surveyed area at Henry Carr crescent, Ikeja

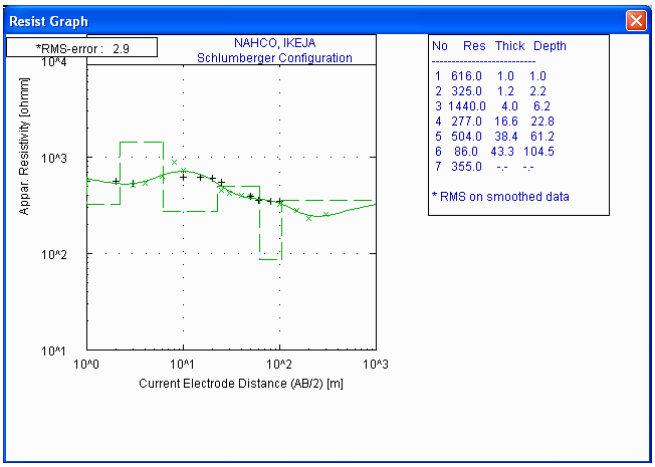


Figure 9 : The Schlumberger depth sounding curve beneath the surveyed area at NAHCO, Ikeja

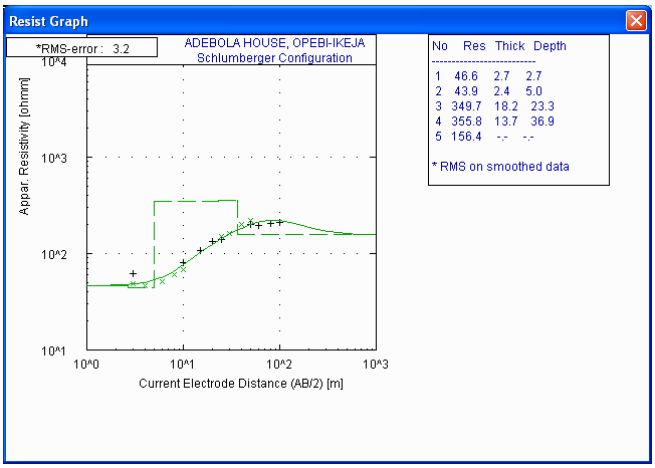


Figure 10 : The Schlumberger depth sounding curve beneath the surveyed area at Adebola House, Opebi, Ikeja

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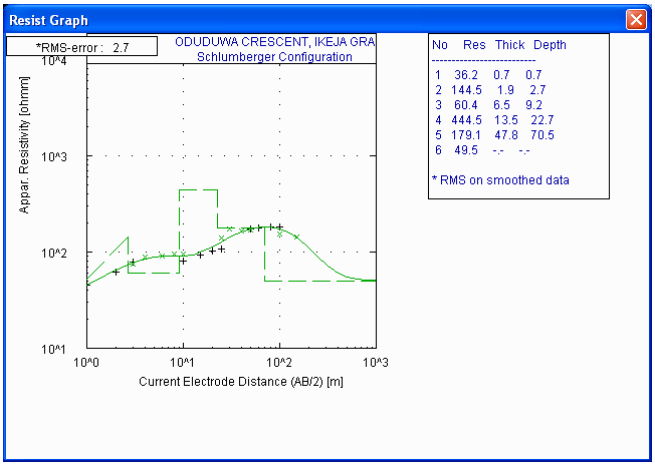


Figure 11 : The Schlumberger depth sounding curve beneath the surveyed area at oduduwa crescent, Ikeja

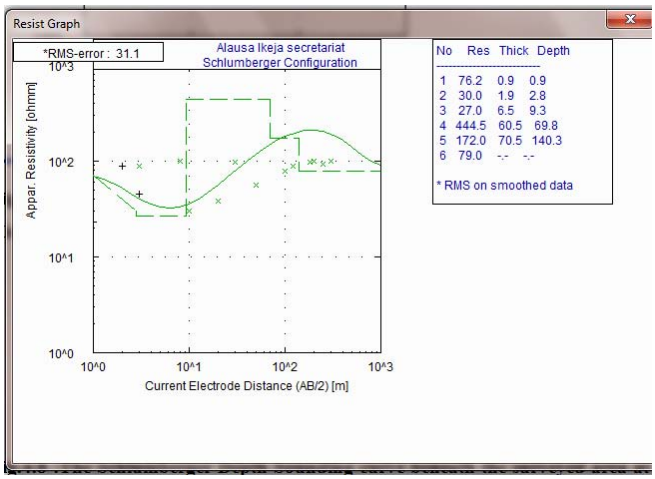


Figure 12 : The Schlumberger depth sounding curve beneath the surveyed area at Alausa Secretariat, Ikeja

IV. Spatial Querry Analysis

Spatial data query were performed using the data generated in terms of resistivity, depth, Lithology in ArcGIS and the following resulted as represented from figure 13 to 17

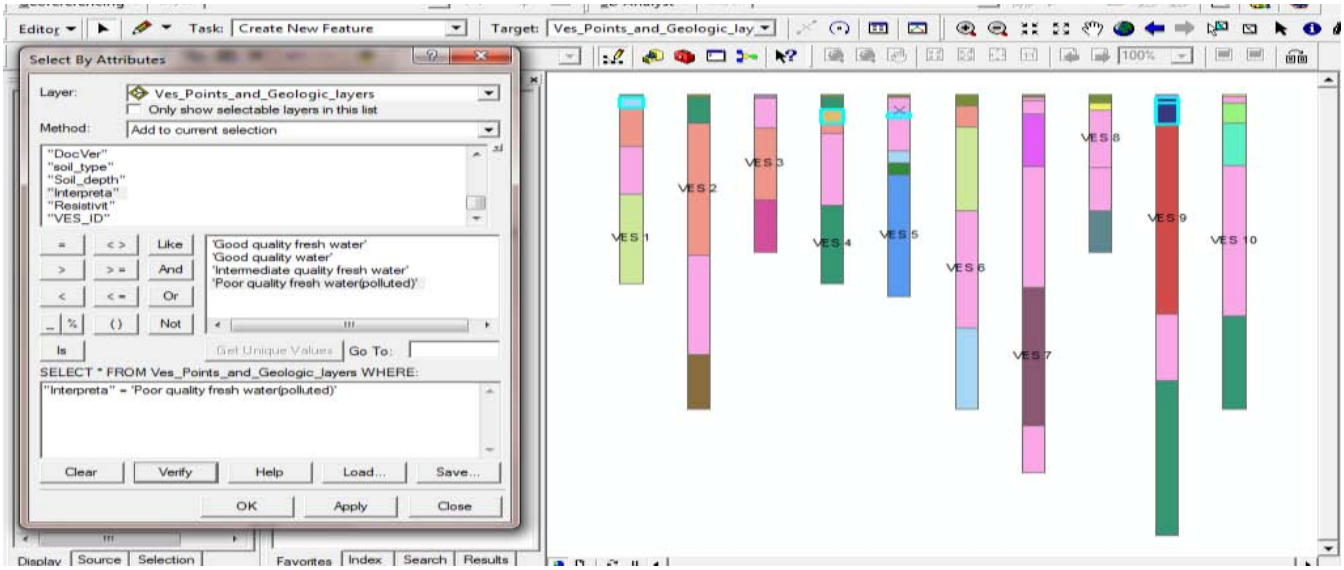


Figure 13 : 2D Query Model showing the Layers of Geoelectric Sections containing poor quality fresh water (polluted) presented as light blue around the geoelectric layers

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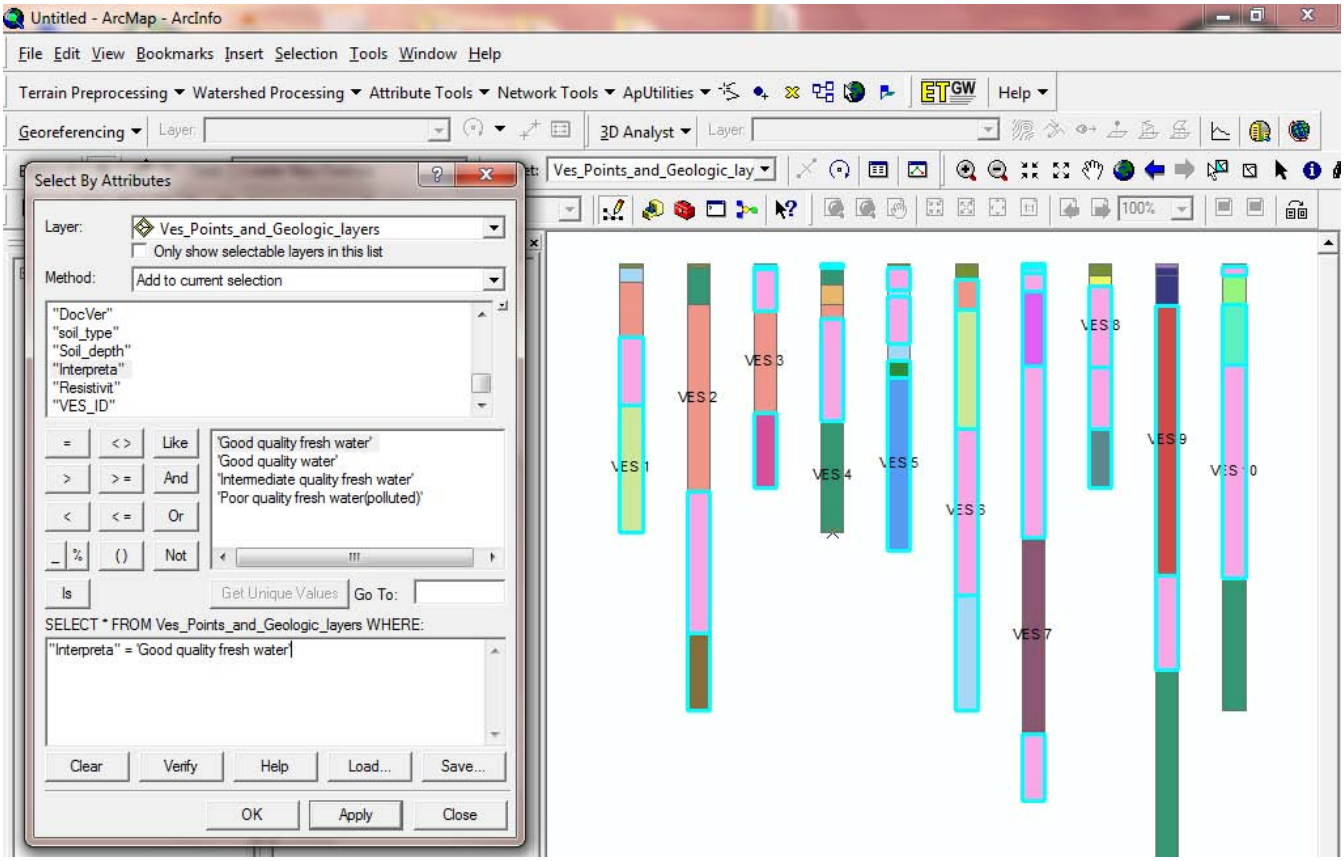


Figure 14 : 2D Query showing Layers of Geoelectric Section containing good quality Fresh Water presented by the light blue colour as seen around the geoelectric layers

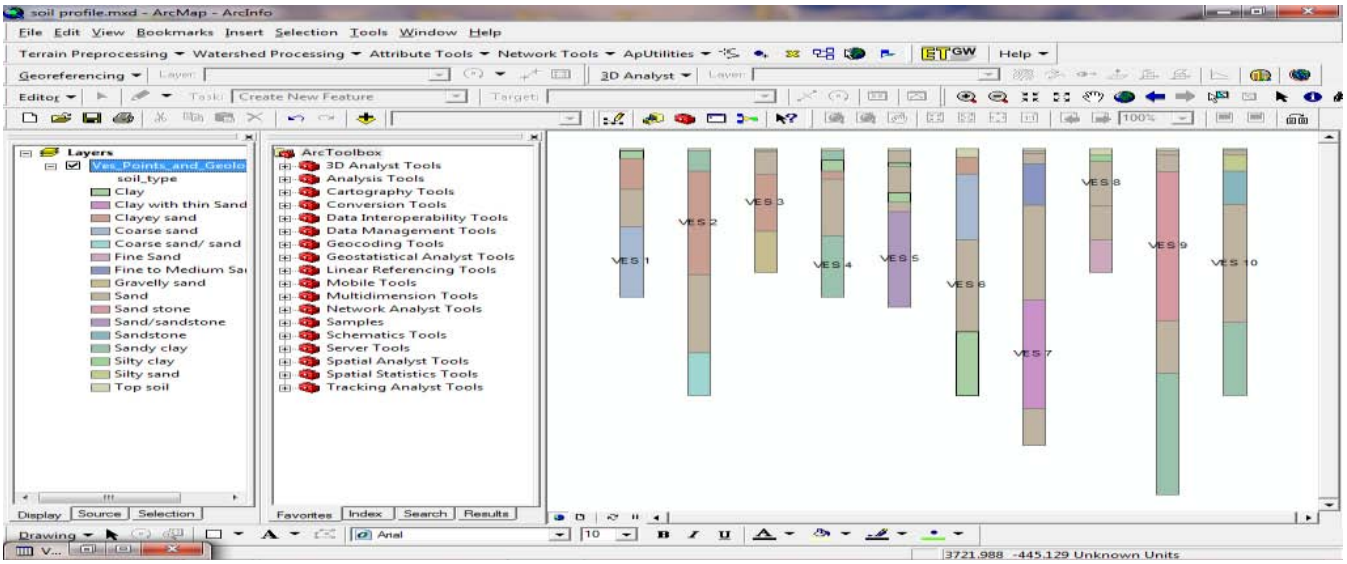


Figure 15 : 2D Query Model showing the distribution of VES stations and Geologic Layers

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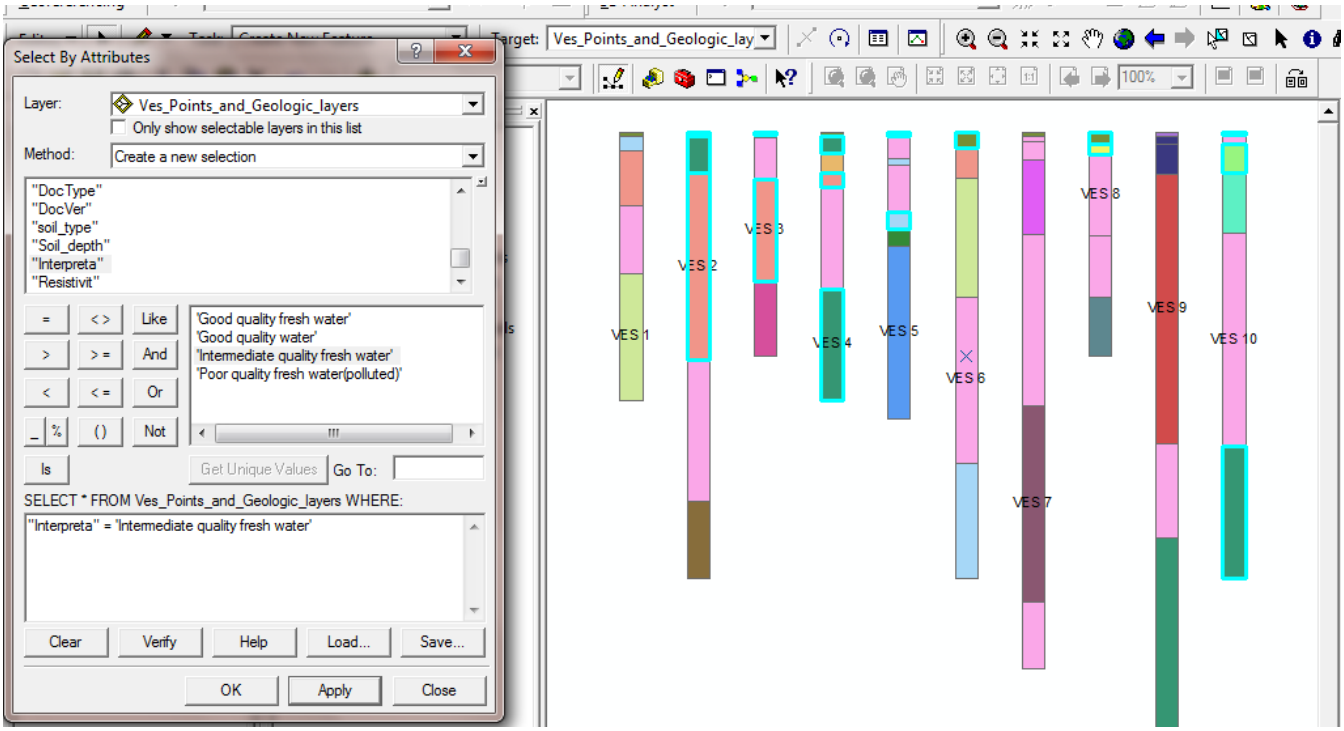


Figure 16 : 2D Query Model showing Layers of Geoelectric Section containing Intermediate quality fresh water presented as light blue around the geologic layers

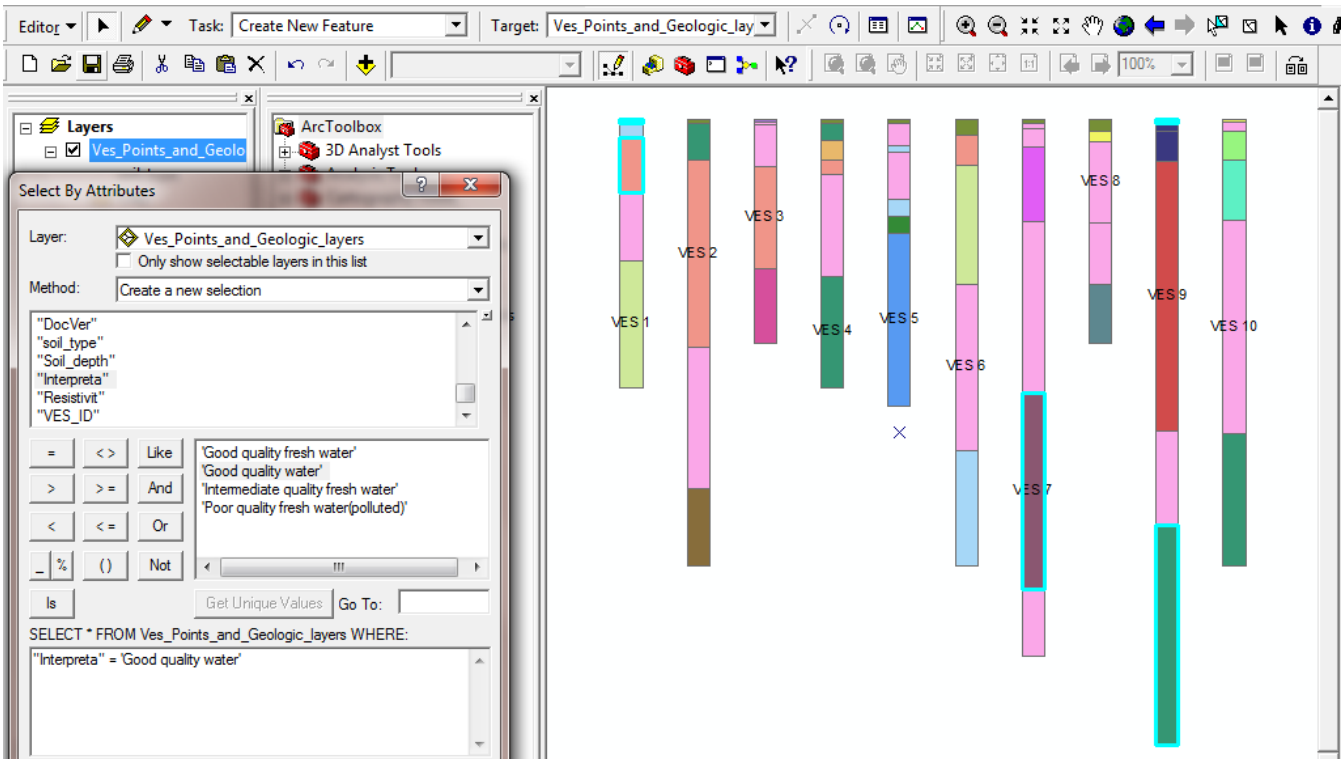


Figure 17 : 2D Query showing Layers of Geoelectric section containing good quality fresh water presented by the light blue colour around the geologic layers

V. Discussion of Results

The results of the vertical electrical sounding carried out revealed fourteen geoeletric Layers which includes the Topsoil, Sand, Clayey Sand, Coarse Sand, Sandy clay, Clay, Gravelly sand, Sandstone, Clay/sand intercalations, clay with intercalations of thin sand, Silty Clay, Silty Sand, Fine sand and Coarse Sand/Sandstone. From the apparent resistivity model of the curves and information from a borehole log and

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published resistivity data (Telford et al; 1990), the equivalent geologic units has been delineated. The aquifer units are Coarse Sand, Sandstone, Fine Sand and Gravelly Sand. The second layer in VES 1 represents Clay with resistivity value of 18 ohm-m and thickness of 3.2m considered as poor quality fresh water which is highly polluted and the fourth layer is characterized with sand having resistivity value of 290 ohm-m and layer thickness of 15.3m envisaged as Good quality fresh water zone. The fifth geoelectric layer is coarse sand with resistivity of 806 ohm-m considered as Good quality fresh water. The third layer in VES 4 is clay with resistivity value of 15.6 ohm-m and thickness of 4.5m considered as poor quality fresh water. This layer has been highly polluted. The fifth layer in this VES is Sand with a resistivity of 365ohm-m and a thickness of 23.0m considered as a good aquifer with Good quality fresh water. The third layer in VES 5 is clay having a low resistivity of 24 ohm-m and a thickness of 3.5 m. This layer is a polluted region considered having poor quality fresh water. The second layer and the third layer of VES 9 delineate sand with resistivity ranging from 27.0 ohm-m to 30.0 ohm-m. These layers are highly polluted due to the leachate effect from the Olososun landfill around Oregun, Ikeja.Lagos State, Nigeria.

VI. Conclusion and Recommendations

From the result of the electrical resistivity sounding carried out in the study area, the study has shown that Geographic Information System (GIS) and Geophysics are very useful in the assessment of the groundwater pollution. GIS Application as a database tool has also been very important and highly useful when integrated with geophysical methods. Most of the surface aquifers that are very nearer to the Oloshosun landfill have been polluted by the adjoining leachate of the Landfill thereby posing a threat to the groundwater of the area. Dwellers very nearer to the oloshosun Landfills are in a great danger because of the fact that most of their surface aquifer has been polluted by the adjoining leachate of the Landfill thereby posing a threat to the groundwater Geology of the area. This effect was noticed in **VES 9** and this occurs between the depths of **2.8m** to about **9.3m**. Between these depths, the possibility of the shallow aquifer to be polluted is very high. The surface aquifer has also been polluted in **VES 5** to the depth of about **6.0m**.It is recommended hydrogeologically that in **VES 2, 3,6,7,8** and **10**, a deep borehole could be drilled to provide good sources of water, especially in **VES 2,** and also a deeper borehole can be drilled in **VES 9** to a depth of 220 to 250m. A further mapping of the fresh water and salt water interface in the coastal aquifers should be carried out concurrently to further delineate possible sub-surface pollution plume to better understand the groundwater conditions of Ikeja and its environs. Other methods that could provide solution to pollution problems of the study area include geochemical analysis of boreholes, wells, and geophysical well logging of the existing boreholes.

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Assessment of the Heavy Metal Contamination in the Danube Delta from the Bioaccumulation Perspective

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Abstract- The objective of this work is to assess the heavy metal contamination of water and sediment in the Danube Delta, approaching also the bioaccumulation and trophic transfer issue. It was conducted in15 sampling sites in Sf. Gheorghe Branch, were collected water, sediment and biological samples from two species of fish with different habitat and trophic level (Crucian carp - Carassius auratus gibelio and Zander - Sander lucioperca). All samples, were analyzed for Pb, Cd, As and Hg by atomic absorption spectrophotometry.

Keywords: danube delta, heavy metals, contamination, bioaccumulation.

GJHSS-B Classification: FOR Code : 840207, 040699



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Assessment of the Heavy Metal Contamination in the Danube Delta from the Bioaccumulation Perspective

Gati Gabriel [α], Cristian Pop [σ], Florin Brudașcă [ρ], Anca Elena Gurzău [ω] & Marina Spînu [¥]

Abstract- The objective of this work is to assess the heavy metal contamination of water and sediment in the Danube Delta, approaching also the bioaccumulation and trophic transfer issue. It was conducted in15 sampling sites in Sf. Gheorghe Branch, were collected water, sediment and biological samples from two species of fish with different habitat and trophic level (Crucian carp - Carassius auratus gibelio and Zander - Sander lucioperca). All samples, were analyzed for Pb, Cd, As and Hg by atomic absorption spectrophotometry. The bioaccumulation and trophic transfer assessment was done calculating the bioaccumulation (BAF) and biomagnification factor (BMF). Our pilot study showed that the heavy metal concentration varies from sediment to water where a significant correlation between water-sediment metals concentration was only in case of As. The distribution of the metals in fish organs shows differences between the two investigated species: in Crucian carp the concentrations of metals were Pb>As>Cd>Hg, Pb and As being predominant in external organs and in Zander the concentrations of metals were Pb> Cd>As> Hg, Cd,As and Hg being predominant in internal organs. BAFs showed a fairly high rate for mercury and lead and low arsenic rate in both species.

Keywords: danube delta, heavy metals, contamination, bioaccumulation.

I. Introduction

Heavy metal pollution constitutes an actual problem in the entire world.

Situated in the eastern extremity of Romania the Danube Delta, is part of the Danube Delta Biosphere Reserve. The Danube Delta's plain covers an area of over 5.800 km2, which includes the 1.800 km2 marine delta plain (Panin, 2003) and it starts from the first bifurcation of the Danube, at Ceatal Izmail, forming the Chilia (Kilia), and the Tulcea distributaries, which 17 km downstream divides again to form the Sulina and Sf. Gheorghe (St. George) distributaries (Panin, 2003).

The objective of this work is to assess the heavy metal contamination of water and sediment and the correlation between them in the Danube Delta. Also, this paper approaches the bioaccumulation and trophic transfer issue, the tendencies that are emerging in the Danube Delta after the pilot study and it has developed an experimental model (pilot study), the establishment of the best fitted sampling and analysis methods for heavy metals, and the choice of the right exposure biomarkers.

II. Materials and Methods

a) Study area

The Danube Delta sampling location was settled in the Sf. Gheorghe Branch area, between the Turcesc and Central Channels, nearby Sf. Gheorghe locality (44°53'N & 29°36'E). it is the area with the fewest point sources of contamination being the place of choice for studying the general heavy metal contamination of the Danube Delta.

Water, sediment and fish samples were collected in October 2012.

b) Sampling

There were 15 sampling sites, and there were collected water and sediment samples for each one, resulting in 15 water samples and 15 sediment samples. Water samples were collected at 20-30 cm under the water surface in 50 ml polyethylene demineralised containers, and conserved through acidification at pH<2 with 0.25 ml of concentrated HNO3 solution, kept at 4°C until the transportation to the laboratory.

Sediment samples were collected from the margin and bottom of the main branch and channels, in 100g amounts, kept at 4°C in metal free plastic bags.

Biological samples were collected from two fish species with different habitat and trophic level. The first one is the Crucian carp (Carassius auratus gibelio), representing a benthic, omnivorous fish with a low-medium trophic level, and the other is the Zander (Sander lucioperca), representing a pelagic, top-carnivorous fish. The sampling consists of liver, spleen, gonads, skin, scales and fins. The samples were frozen immediately.

c) Analytical methods

All samples, of each type, were analyzed for Pb, Cd, As and Hg.

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The water samples were analysed using a Zeenit 700P Spectrophotometer (AAS). HG-AAS (Hydride Generation) was used for the analysis of As, supplemented with amalgamation and CVAA (Cold Vapor Atomic Absorption) method for Hg, and respectively the ET-AAS (Electrothermal) method for Pb and Cd.

The sediment samples were subjected to a microwave digestion in suprapure nitric acid, using a Mars 6 Microwave digester. After that, the metals were analysed using a Zeenit 700P (AAS), As, Pb and Cd with the ET-AAS and Hg with the HG-AAS with Amalgamation/CVAA method.

The biological samples were also mineralized in suprapure nitric acid in a microwave digester. These were analysed using a Zeenit 700P Spectrophotometer (AAS), through ET-AAS method for Pb and Cd, HG-AAS Method for As and HG-AAS with Amalgamation/CVAA method for Hg.

An external standard curve method was used for the calculation of the concentrations.

Quality control was made through specific methods, to evaluate the accuracy of our analyses, meeting the RENAR (the Romanian Accreditation Association) standards and certifications.

d) Data analysis

The bioaccumulation and trophic transfer assessment was done by the calculation of the bioaccumulation factor (BAF) (1) and respectively the biomagnification factor (BMF) (2). These were calculated following Gobas & Morrison`s (2000) formulas:

1. BAF= CB/CW
2. BMF= CB/CD

The BAF is expressed in the form of the ratio between the chemical concentrations in the organism (CB) and the chemical concentrations in the water (CW), respectively the BMF is the ratio of the chemical concentrations in the organisms to the concentration in the organism`s diet (CD) (Gobas & Morrison, 2000). The chemical concentration in the organism is usually expressed in units of mass of chemical per kg of organism, whereas the concentration in water is expressed in mass units per litre. Therefore, the unit for BAF is L/kg, while BMF is unitless. The weight of the organism can be expressed on a dry weight (DW), wet weight (WW) or lipid weight (LW) basis (Idem). For the use of other studies as reference in the comparison of the BAF and BMF, the weight of the organism is expressed in a wet weight basis. Geographical representation through GIS allows a more efficient approach for the integrated analysis of the spatial-temporality aspect. The maps were created using Open Source GIS Software – Q-GIS 1.8 (Quantum GIS, 2012) and the Geographic Resource Analysis Support System (GRASS) 6.4.2 (GRASS, 2012).

To highlight the spatial distribution of the heavy metal concentrations from the water and sediment samples, these were rendered in a geographic information system (GIS). Metal concentrations are represented by bar charts.

The analyses results (heavy metals) of water samples were correlated to the sediment samples from the same sampling sites. The correlations were verified through the Pearson`s correlation coefficient ("r"), which is a measure of the strength and direction of the linear dependence between two variables. Pearson`s correlation coefficient can take values between -1 (perfect anti-correlation) and 1 (perfect correlation).

III. Results & Discussions

a) Water and sediment results

The heavy metal concentration and distribution of the samples varies from sediment to water. Higher values were found in sediments mainly close to the Sf. Gheorghe Branch, as can be seen in Figure 2. The sediment analysis revealed lead (18,18 mg/kg DW +/- s.d. 9,8), arsenic (7.97 mg/kg DW +/- s.d. 5,6) and mercury (0,04 mg/kg DW +/- s.d. 0,04), while the water analysis revealed only lead (1,01 μg/L +/- s.d. 0,3) and arsenic (1,96 μg/L +/- s.d. 0,6). The detection limits of our methods were 0,1 mg/kg DW and 0,5 μg/L for cadmium in sediment and water, respectively 0,1 μg/L for mercury in water. There was no concentration exceeding recorded, according to the 161/2006 Romanian Normative framework.

Even if there aren`t any major contamination point sources identified in the sampling area, heavy metal concentrations were found in the water and sediment. Due to the emission of heavy metals along the international course of the Danube River system and to the sedimentation and re-suspension hydrodynamic conditions that occur, the deposition is taking place far downstream of the discharge. Even so, compared to the results of Woitke et al. (2003), regarding the range of metal concentrations through the entire Danube River and its Delta, Pb, Cd, As and Hg concentrations of our analysed sediment samples fall in the lower limits or even slightly below the Danube River`s concentration range (As [9-68,9], Cd [<1,1-25,9], Pb [14,7-107,6] and Hg [<0,1-2,37], expressed in mg/kg DW).Our results of metal concentrations in sediment, are also comparable to those in the Chilia Branch and it`s secondary delta from the territory of Ukraine (Vignati & Berlinsky 2010) being slightly lower in a few places.

Table 1: Pearson Correlation for water-sediment samples

	Pb in sediments	As in sediments
Pb in water "r"	-0.344	
As in water "r"		0.537

From our Pearson calculated statistics data (Tab.1) for heavy metal concentrations, we can say that

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there is a low and negative ("Pearson") correlation between the sediment-water sample concentrations for Pb (-0,344), meaning that there is an anti-correlation. In the case of As, the correlation is higher and positive

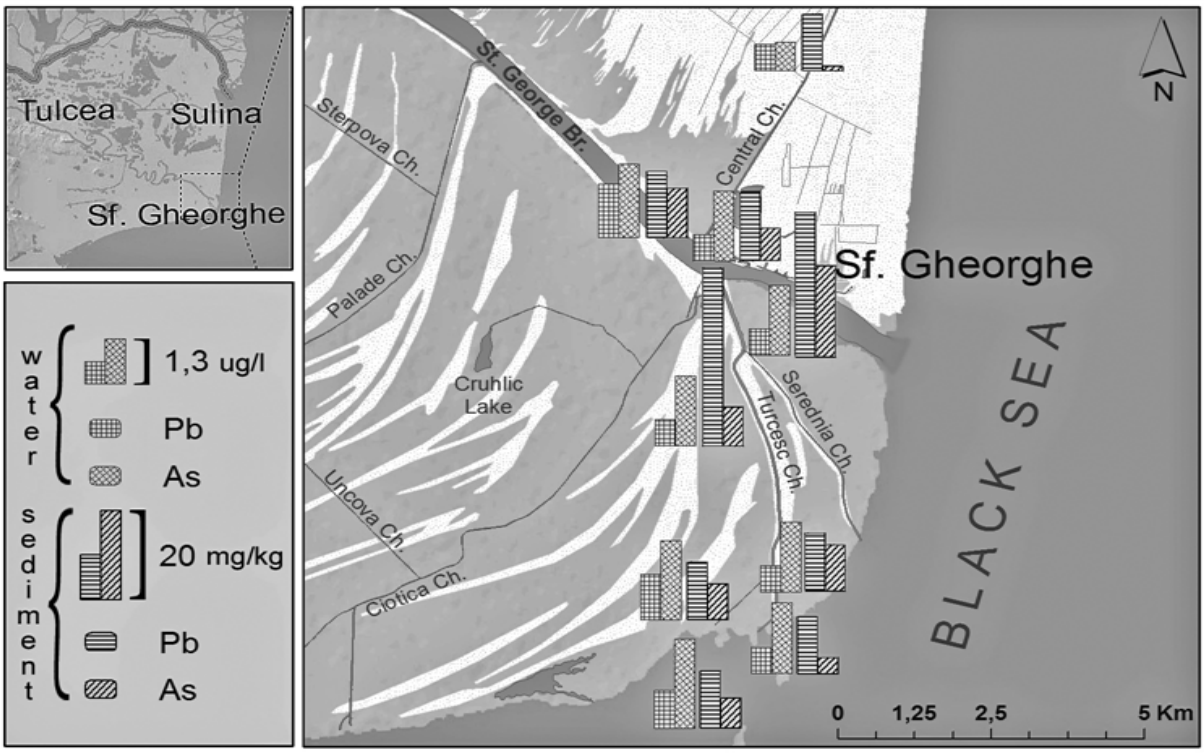


Fig. 2 : Above is the example of single column image. Images must be of very high quality

(0.537). These results are suggesting that there is mobilisation and balance between these two matrices. While the sediment analysis revealed Pb>As>Hg, the water analysis revealed only As>Pb.

This can happen because of the different physico-chemical conditions that occur in the Danube Delta, due to the low water speed(0,3 m/s - shallow channels to no more than 2 m/s - deep parts of the main branches), the floodplain width and specific flow hydraulics. In wider floodplain sections, the heavy metals tend to accumulate near the channel margins, from where these can be remobilised due to bank erosion processes (Wyzga & Ciszewski, 2010).

b) Fish sample results

Heavy metals tend to be absorbed by some fish species through the food, water and sediments, regardless of their biological needs or nutritional category (Yilmaz, 2003, Mendil et al., 2010).

In the figure 3 we present the mean heavy metal concentrations in internal (liver, spleen, gonads) and external (skin, scales, fins) organs of the sampled fishes. Overall, for each studied heavy metal, the concentrations in all the analysed organs were higher in Crucian carp than in Zander.

Our sampled Crucian carps revealed (Fig. 3) higher levels of Pb (0.85 mg/kg WW), compared to As (0.38 mg/kg WW) and Cd (0.13 mg/kg WW) levels; the Hg concentration was the lowest between the four measured elements (0.08 mg/kg WW). The predominant bioaccumulation of Pb and As are in external organs, while the Hg has been found in higher concentrations in internal organs. Related to Cd, this metal was similarly bioaccumulated in external and internal organs.

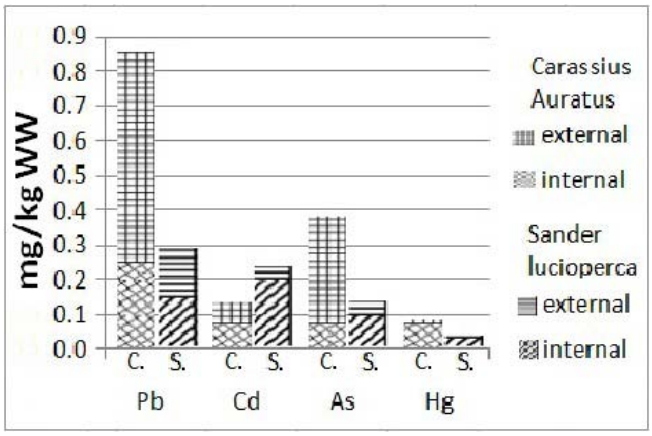


Fig. 3 : Mean metal concentrations in sampled fish in internal and external analysed tissue

Detailing the bioaccumulation of studied metals in organs, it has to be mentioned that the concentration of cadmium from the gonads (0,18 mg/kg WW) and scales (0,12 mg/kg WW), and of lead from the liver (0,57

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mg/kg WW) were over the maximum levels accepted for human consumption according to the European references (Commission Regulation (EC) 1881/2006). The order of the affected tissue by the highest quantity of heavy metals is liver>gonads>scales>skin>fins> spleen.

It is known that benthic fish species are dietary exposed to heavy metals through consumption of zoobenthic biota (e.g. shellfish, worms) from contaminated sediment (Sakurai et al., 2009; Clearwater et al., 2002)

Our sampled Zander individuals (Fig. 3) had higher concentrations of Pb (0,30 mg/kg WW) and Cd (0.24 mg/kg WW), compared to lower concentrations of As (0,13 mg/kg WW) and Hg (0,03 mg/kg WW). The distribution of the metals in Zander organs shows differences compared to the Crucian carp. Cd, As and Hg are predominant in internal organs, while the Pb similarly bioaccumulated in external and internal organs.

Detailing the bioaccumulation of studied metals in organs, it has to be mentioned that cadmium measured in gonads (0,31 mg/kg WW), liver (0,22 mg/kg WW), scales (0,12 mg/kg WW) and spleen (0,055 mg/kg WW) and lead in skin (0,35 mg/kg WW) exceeded the maximum levels accepted for human consumption according to the European references. The order of the affected tissue by the highest quantity of heavy metals is liver>gonads>skin>spleen>scales> fins.

In the Danube River and Delta, there are few studies on accumulation of heavy metals in fish species to make reference to. Zelika et al. (2010) showed high concentrations of metals in Pontic shad (Alosa immaculata Bennet 1835) gills, liver and lower in the muscles, mainly Cd and As levels were higher than the maximum acceptable concentrations for human consumption according to the European references. Jaric et al., 2011 found high levels of heavy metals in sterlet (Acipenser ruthenus) liver and lower levels in the muscles, acceptable for human consumption according to the European references, excepting cadmium. The sheatfish (Silurus glanis) was measured with the lowest levels of all metals (Pantelica et al., 2012). Filazi et al., 2003 revealed that many fish species have high concentrations of Cu, Pb and Cd, especially in the liver. The highest concentrations were found in August and the lowest in May.

The metal bioavailability has a great effect over the bioconcentration and bioaccumulation in the aquatic biota.

The bioaccumulation factors (BAFs) calculated for our sampled fish (Fig. 4) showed a fairly high rate for mercury, followed by lead and cadmium in the case of the Crucian carp, and a high rate for cadmium, followed quite closely by mercury and lead in the case of the Zander. The arsenic showed a low BAF in both species. Different studies show that the heavy metals bioaccumulation factors for all organisms are highest in the plankton, followed by the zoobenthos, predator fish species and herbivorous fish species depending on the organisms place in the food chain, their feeding behaviour specific habits, physico-biochemical characteristics and age (Culioli et al., 2009, Tao et al., 2012, Pantelica et al., 2012). In several studies, the highest bioaccumulation factor in the fish organs and

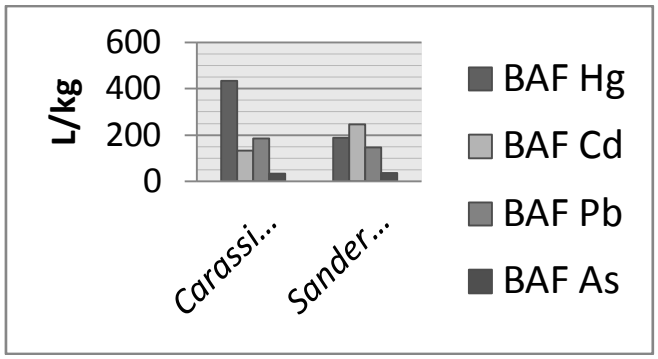


Fig. 4 : Bioaccumulation factors for sampled fish (mean)

tissues is shown by Fe and Zn, followed by Cu, Pb, Cd and As (Uluturhan & Kucuksezgin, 2007; Ayotunde et al., 2012; Nwani et al., 2010; Farombi et al., 2007).

Classing our resulted BAFs by specific metal and fish tissue, arises the following remarks: Hg and As revealed the highest values in the liver of both species (1092 L/kg Hg for Crucian carp and 361,4 L/kg Hg for Zander, respectively 89,6 L/kg As and 86,1 L/kg As); Cd showed the highest values in the gonads of both species (356,4 L/kg for Crucian carp and 629,1 L/kg for Zander); Pb showed the highest values in the liver of the Crucian carp (564,3 L/kg) and in the skin of the Zander (343,7 L/kg).

Several authors observed that fish from various locations show similarities regarding the assimilation and bioaccumulation of metals in different parts of their organisms. The concentration of heavy metals was observed to decrease in the following order: liver> gills> skin and gonads> muscles and other measured tissues (Bashir et al., 2012; Cogun et al., 2006; Dural et al., 2006; Yilmaz, 2003).

Assuming that the Crucian carp signs up as a potential prey of the Zander, the calculation of the trophic transfer, based on our sampled fish, can be made through the biomagnification factors. The results revealed that there is a high biomagnification potential for cadmium (1,857), an even rate for arsenic (1,039) and a low rate for lead (0,795) and for mercury (0,431). Based on a study of Clearwater et al. (2002), this can also mean that the Zander is more exposed to cadmium, the two species are relatively equally exposed to arsenic, while the Crucian carp is more exposed to mercury and lead, since the exposure is not strictly dietborne. Furthermore, the dietary exposure is not strictly given by the consumed pray, but also from the ingestion of sediments that can occur in many forms

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(e.g. in the digestive system of the pray, attached to the pray`s body, etc.), (Clearwater et al., 2002).

Adams et al. (2000) mention that for aquatic organisms, the bioaccumulation process is the most significant route of uptake for most metals. Only a few metals, like mercury, are believed to have a higher uptake through food than through the water component. Fish closely regulate their internal levels of essential metals mainly through bioaccumulation. Non-essential metals are often regulated to varying degrees because these regulating mechanisms are not metal-specific (Adams et al., 2000). As a result of these processes an inverse relationship exists between the metal concentration from the water and the specific bioaccumulation factor. Therefore, at low metal concentrations in water, aquatic organisms are accumulating essential metals, and non-essential metals along with these, to meet their metabolic needs. At high concentrations, only fish with active regulation mechanisms are able to excrete excess metals and try to limit the uptake (Brix et al., 2001). As a result, the bioaccumulation factor is not always an intrinsic property of the exposure level. Usually, higher values tend to appear at low water concentrations and conversely.

In order to make a more efficient assessment and control of the level of contaminants in fish products designated for human consumption, the European legislation must be thoroughly reviewed and complemented (Jaric et al., 2011).

IV. Conclusion

- Our pilot study showed that the heavy metal concentrations and distributions of the samples varies from sediment to water.
- A significant correlation between water-sediment concentrations of studied metals was significant only in the case of As, suggesting mobilisation and balance between these two matrices.
- The distribution of the metals in external and internal fish organs shows differences between the two investigated species. In Crucian carp the concentrations of metals were Pb>As>Cd>Hg, Pb and As being predominant in external organs. In Zander the concentrations of metals were Pb> Cd>As> Hg, Cd, As and Hg being predominant in internal organs. There was recorded an exceeding of the European references, for cadmium and lead.
- The order of the affected tissue by the highest quantity of heavy metals, even different for the two fish species investigated highlighted that liver and gonads are the main internal organs bioaccumulating metals.
- The bioaccumulation factors (BAFs) showed a fairly high rate for Hg>Pb>Cd in the case of the Crucian carp, and a high rate for Cd>Hg>Pb in the case of the Zander.
- The bioaccumulation of heavy metals and metalloids in fish species is proved to be species, tissue and element dependent, our study revealing higher concentrations of metals in Crucian carp compared to Zander.

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The Development of Environmental Management Indicators for Buddhist Temples

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Abstract- The development of factors and indicators of the environmental management for temples is another way to promote and support the knowledge and understanding about environmental issues occurring in present society which involves the environment in temples and also communities. There have been many factors which cause those environmental issues, both intentionally and unintentionally. Therefore, temples, communities, educational institutes, local administrative organizations, Sub-district (Tambon) Public Health Offices, private organizations, and other agencies have to participate in the environmental development in temples for the benefits of monks and the people who come to get benefits in temples and communities.

Keywords: development, indicators, environmental management, buddhist temples, environmental promotion.

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The Development of Environmental Management Indicators for Buddhist Temples

Vinai Veeravatnanond [α], Bunlert Wongpho [σ], Thongchai Nilkham [ρ] & Tikumporn Arunsripradit [ω]

Abstract- The development of factors and indicators of the environmental management for temples is another way to promote and support the knowledge and understanding about environmental issues occurring in present society which involves the environment in temples and also communities. There have been many factors which cause those environmental issues, both intentionally and unintentionally. Therefore, temples, communities, educational institutes, local administrative organizations, Sub-district (Tambon) Public Health Offices, private organizations, and other agencies have to participate in the environmental development in temples for the benefits of monks and the people who come to get benefits in temples and communities.

This development of factors and indicators of the environmental management was carried out under the Environmental Education Program, College of Innovative Management, Valaya Alongkorn Rajabhat University under Royal Patronage. The research was supported by the Department of Environmental Quality Promotion. The study of the relevant principles and concepts was done to gain the factors and indicators of the environmental management for temples. The participatory process was utilized with monks, temple wardens, resource persons, academics, experts, local government officials, involved persons, and people who came to get benefits in the temples. The study was carried out through brainstorming of people from the central unit and different regions namely central, northern, southern, and northeastern regions. In conclusion, the sharing factors and indicators were obtained as follows. Factor 1 Physical and Biological Environment comprised 6 indicators. Factor 2 The Conservation and Quality Development of the Environment comprised 6 indicators. Factor 3 The Management of Pollutions, Wastes, and Waste Water comprised 4 indicators. Factor 4 Well Being and Management comprised 9 indicators. Factor 5 The Promotion of Morals toward the Environment comprised 6 indicators. Factor 6 The Promotion of Learning comprised 6 indicators.

The factors and indicators obtained from the development have covered physical and biological environment, well being of the monks, and the involvement of people to promote and support the environmental management and to look after well being of the monks. The implementations of these factors and indicators depend upon the context and potential of each temple. They allow temples to have appropriate environmental management and promote sustainable management of the environment.

Keywords: development, indicators, environmental management, buddhist temples, environmental promotion.

I. Introduction

The present world has been rapidly changed from the past. The massive flow of western culture in the era of globalization has swooped countries around the world unavoidably. This has caused changes to ways of life in different levels of society starting from the levels of family, community, culture and tradition. These historical roots of society have been modified according to the fashion. The small society with kindness and sharing has been changed to big society which combines all cultures together. This matter seems to be scary if there is no any good way to manage and serve these changes. Especially, there has been a lot of fighting for limited natural resources which are not sufficient for the future needs. This will cause many problems afterward. One more issue is that, at present, natural resources and the environment have been critically destroyed to meet the requirements of humans who have more needs other than those four common needs. This dramatically phenomenon has caused the reduced numbers of trees, plants and animals. It also causes the problems of soil deterioration, water shortage, pollutions, wastes and changes of climate conditions in atmosphere which very much vary, global warming, and unbalanced ecological system.

Thai society is a society with respect of Buddhism and 95% of population is Buddhists. Buddhism is a religion with an emphasis on teaching humans with appropriate way of life, and without luxury and shortages which lead to troubles. This way is then considered to be an important approach to practice and related to way of life in Thai society. It is also a good model for practice from generation to generation and compared as a shield to protect or delay the mental and environmental deteriorations or the morals toward the environment. With this significance, Lord Buddha then set regulations for monks to practice as a model for reducing the use of excessive factors or resources other than those four common needs. The Dharma disciplines have been used as criteria or regulations established.

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They are, for example, knowing to estimate amount of offered food to be consumed, considering appropriate food, using limited number of sarongs and blankets, living in safe places, considering herbs for direct treatments, and establishing regulations for study and do & don't practices for monks and nuns as priesthood.

National Office of Buddhism established regulations for the development of temples to meet the determined standards. Temples should have roles to do the functions and arrange activities. The abbots and the temple committee must have modern management system for temples. Information technology should be brought to use for data collection. The management of a temple should provide opportunity to community to get involved. The purposes of these regulations are: 1) to be guidelines to develop temples according to the standards of National Office of Buddhism; 2) to facilitate the operations with highest efficiency and effectiveness, and the same standards; 3) to establish standards for fundamental development for temples leading to the operations of temples' activities determined by National Office of Buddhism (education park in temple, and good developed temple with outstanding performance; 4) to promote experience in developing temples as well as continuing & sustainable development; 5) to encourage temples with learning process for self development to gain quality, success, and social acceptance; and 6) to promote work integration of all sectors, efficiency and full benefits in developing temples to meet the standards.

However, the establishment of criteria for temple development to cover all aspects must include the matter of environment, especially with the way of life with environmental friendly living as a good model for society. These criteria for the environmental management for temples should contain factors covering the physical and biological areas, and the practices of those who come to get benefits within the temples, offering things to monks, and the practices of monks who are considered as important persons to teach the Dharma principles and practices, and be respected by people. Therefore, each area should have indicators as criteria for appropriate operations.

Therefore, the Environmental Education Program under Valaya Alongkorn Rajabhat University under Royal Patronage conducted a project to study and develop factors and indicators of environmental management for temples. The budget for the project was supported by the Bureau of Public Participatory Promotion and the Department of Environmental Quality Promotion. The project desired those who involved with temple development in the context of Thailand to participate by expressing their opinions toward the environmental management within the temples. The evaluation criteria were used as guidelines for application appropriately, and as a good model for sustainable environmental management in the future. The purposes of the development were to 1) establish factors and indicators of environmental management for temples, 2) study the factor about community participation in environmental management within temples, and 3) evaluate the implementations of the factors and indicators of environmental management for temples.

II. Methods to Develop Factors and Indicators of Environmental Management for Temples

Step 1 Arranged a meeting for the committee for developing (draft) criteria of environmental management for temples. The meeting was conducted in order to make (draft) criteria of environmental management for temples which comprised 6 factors and 73 indicators. Factor 1 Physical and Biological Environment comprised 15 indicators. Factor 2 The Promotion of Learning comprised 15 indicators. Factor 3 The Management of Pollutions and Waste comprised 10 indicators. Factor 4 Environmental Ethics comprised 11 indicators. Factor 5 Well Being and Management comprised 13 indicators. Factor 6 The Conservation and Quality Development of the Environment comprised 9 indicators.

Step 2 Organized a meeting for the committee for developing criteria of environmental management for temples which consisted of 15 resource persons. The meeting was conducted in order to consider the draft of management for temples which was drafted in Step 1. Regarding the results from the meeting of the resource persons, the criteria of environmental management for temples were obtained as follows. Factor 1 Physical and Biological Environment comprised 8 indicators. Factor 2 The Promotion of learning comprised 7 indicators. Factor 3 The Management of Pollution and Waste comprised 5 indicators. Factor 4 Environmental Ethics comprised 8 indicators. Factor 5 Well Being and Management comprised 11 indicators. Factor 6 The Conservation and Quality Development of the Environment comprised 5 indicators.

To conclude, the criteria of environmental management for temples gained from the consideration and agreement of resource persons totally comprised 6 factors and 44 indicators.

Step 3 Conducted a focus group discussion of 4 regions. The criteria of environmental management for temples from the consideration process of the resource persons were brought by the research team to the focus group discussion of 4 regions. The discussion aimed to investigate the opinions toward the participations of communities and the sample of 40 temples in both urban and rural areas. The targets of the discussion comprised 240 monks, temple wardens and people who got the benefits in the temples. They were 6 of them for each temple. The data from this focus group discussion

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were analyzed for the correlation coefficient and the confirmatory factor analysis was carried out for those 6 factors. The results gained were congruent and related into the same direction. This indicated that the criteria of environmental management for temples were appropriate to be implemented.

Step 4 Organized a public hearing. The research team brought the criteria of environmental management for temples to the public hearing of the academics, experts, local government officials, and those who involved together to consider and criticize the criteria of environmental management for temples of 4 regions. After that, the differences of data obtained from each region were analyzed and then synthesized to prioritize the factors and indicators as follows. Factor 1 Physical and Biological Environment comprised 6 indicators. Factor 2 The Conservation and Quality Development of the Environment comprised 3 indicators. Factor 3 The Management of Pollutions, Wastes, and Waste Water comprised 4 indicators. Factor 4 Well Being and Management comprised 9 indicators. Factor 5 The Promotion of Morals toward the Environment comprised 6 indicators. Factor 6 The Promotion of Learning comprised 5 indicators.

Step 5 Arranged a meeting to conclude the evaluation of criteria. A meeting for the committee for developing criteria of environmental management for temples was organized to consider the criteria obtained from the meetings from steps 2 to 5. It was also to conclude the factors and indicators of environmental management for temples gained from participatory process of all sectors namely monks, temple wardens, resource persons, academics, experts, local government officials, involved persons, and people who came to get benefits in the temples through brainstorming from the central unit and different regions namely central, northern, southern, and northeastern regions. To conclude, there were totally 6 main factors and 32 indicators. Factor 1 Physical and Biological Environment comprised 6 indicators. Factor 2 The Conservation and Quality Development of the Environment comprised 6 indicators. Factor 3 The Management of Pollutions, Wastes, and Waste Water comprised 4 indicators. Factor 4 Well Being and Management comprised 9 indicators. Factor 5 The Promotion of Morals toward the Environment comprised 6 indicators. Factor 6 The Promotion of Learning comprised 6 indicators.

Conclusion about the factors and indicators of environmental management for temples Details for the factors and indicators of environmental management for temples were as follows.

Factor 1 Physical and Biological Environment comprised 6 indicators as follows.

Indicator 1.1 The temple has plans for the development and the appropriate utilization of the space within the temple.

Indicator 1.2 The temple has green and shaded areas to protect sunshine, rain and natural disasters; grows local plants, important plants mentioned in Buddhism, and flowers.

Indicator 1.3 Places for monks to live, sleep and sit and other constructions are strong, save and suitable for usage.

Indicator 1.4 Infrastructures within the temple are comfortable, convenient and suitable for usage.

Indicator 1.5 The temple has boards and maps informing places, buildings and important places within the temple.

Indicator 1.6 The temple should have appropriate sanitary crematory or places for making merits for the community.

Factor 2 The Conservation and Quality Development of the Environment comprised 6 indicators as follows.

Indicator 2.1 The temple has gardens for herbs, local plants or various kinds of plants appropriate to geographical conditions for the best benefits of the temple and community.

Indicator 2.2 The temple has a regular maintenance of the plants.

Indicator 2.3 The temple promotes the growing of herbs for consumption.

Factor 3 The Management of Pollutions, Wastes, and Waste Water comprised 4 indicators as follows.

Indicator 3.1The temple has systems to deal with wastes and waste water.

Indicator 3.2 The temple regularly cleans its buildings and areas.

Indicator 3.3 The temple promotes and supports the prevention of insects and animals that are poisonous and carriers of disease by using natural methods.

Indicator 3.4 The temple has a protection management of smell pollution, dust, smoke, noise and others.

Factor 4 Well Being and Management comprised 9 indicators as follows.

Indicator 4.1 The temple promotes sanitation for monks and people who come for religious ceremonies within the temple.

Indicator 4.2 The temple encourages and supports the monks to look after their health regularly.

Indicator 4.3 People provide clean water and the monks have nutritious food according to the principles of food sanitation.

Indicator 4.4 The temple should have food offered by people appropriately to their health.

Indicator 4.5 The temple provides containers for food and keeps them clean as always.

Indicator 4.6 The temple encourages people to arrange simple religious ceremonies.

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Indicator 4.7 The temple should provide clean water to be used in religious ceremonies.

Indicator 4.8 The temple promotes to reduce the use of candles and incense or joss sticks in religious ceremonies.

Indicator 4.9 The temple should provide clean places for the monks to sleep.

Factor 5 The Promotion of Morals toward the Environment comprised 6 indicators as follows.

Indicator 5.1 The temple should promote good behaviors and conducts in doing the religious ceremony intentionally.

Indicator 5.2 The temple encourages appropriate and friendly uses of verbal language and practices between monks and people.

Indicator 5.3 The temple promotes the uses of environmental friendly goods.

Indicator 5.4 The temple encourages people to offer themselves for the benefits of the temple and Buddhism.

Indicator 5.5 The temple does not allow people to leave their animals in the temple.

Indicator 5.6 The temple promotes its place as all vices free zone.

Factor 6 The Promotion of Learning comprised 6 indicators as follows.

Indicator 6.1 The temple records the history of the temple, religious places and community.

Indicator 6.2 The temple has data bases for plants, herbs and places within the temple together with materials for public relations.

Indicator 6.3 The temple produces of the public relations materials for the learning sources of community.

Indicator 6.4 The community provides supports and promotion of learning within the temple.

Indicator 6.5 The teaching of monks should include knowledge about the environment, national resources, disasters, and good traditions and culture of the community.

III. Discussion

Regarding the development of criteria of environmental management for temples, it was found that the criteria comprised 6 factors as follows. Factor 1 Physical and Biological Environment comprised 6 indicators. Factor 2 The Conservation and Quality Development of the Environment comprised 6 indicators. Factor 3 The Management of Pollution, Wastes, and Waste Water comprised 4 indicators. Factor 4 Well Being and Management comprised 9 indicators. Factor 5 The Promotion of Morals toward the Environment comprised 6 indicators. Factor 6 The Promotion of Learning comprised 6 indicators. In each factor, the discussion was made as shown below.

Factor1 Physical and Biological Environment - The concept is that Buddhist temples, both in urban or rural areas, are different in environmental conditions. Therefore, each temple should determine its own vision, mission, and clear operational plan in relation to the Buddhist Monk and Novice Administration Act and the global changes. The development and improvement of physical and biological environment should provide Buddhists, people and organizations with opportunities to get involved. This can be done by using the environmental friendly ways of life based on the Philosophy of Sufficiency Economy.

Factor 2 The Conservation and Quality Development of the Environment – The concept is that, at present, local plants including herbs basically used as medicines to cure illness are quite rare to fine and reduced in amount. Therefore, temples, which are considered as centers for involvement and places for different activities since the past until the present, should have roles and functions in promoting the environmental conservation of various plants. This is done in order to maintain them, make benefits to the communities, and also increase the biological diversity at the same time.

Factor 3 The Management of Pollution, Wastes, and Waste Water - The concept is that Pollutions and wastes are disgusting things for the society and have affected the heath and sanitation of people. Temples should therefore be clean and green places without wastes and pollutions suitable for monks to do religious ceremonies or activities and also people who come to practice Dharma and get other benefits. The temple should then have correct management to deal with pollutions and wastes and to prevent impacts on health, sanitation, and ecological system in general.

Factor 4 Well Being and Management - The concept is that monks are those who play important roles to inherit or continue the Buddhism and to teach its principles to people for the promotion of intellectual, moral, and ethical development. Unfortunately, at present, it has been found that monks have many health problems such as diabetics, high blood pressure, high cholesterol and chronic communicable diseases. Thus, the way to promote the strong health and well being of the monks involves things that are offered or provided by people. Also, people who come to arrange religious ceremonies or activities within the temples should have well being and can bring the good things from the temples to be used in their families and communities.

Factor 5 The Promotion of Morals toward the Environment - The concept is that the religious ceremony arrangements of people at present, without correct knowledge, are deviated from those taught by Lord Buddha. Together with the current global and natural changes, people should practice the religious ceremony strictly for their own benefits, not too much trouble to other lives.

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Factor 6 The Promotion of Learning - The concept is that in the era of globalization, there have been wider communication and learning of the people starting from community, society, country to the global levels. The present society has then become or placed an importance on a learning society. The temples are therefore considered as a learning resource in the society. They should promote life-long learning with useful information provided to people who come to contact or do activities within the temples. This will help provide them knowledge about environmental situations, and self development together at the same time with intellectual development.

From all 6 factors, they were relevant to the annual meeting of the National Health Assembly which mentioned about the roles of monks toward the society. Apart from their teaching role to people, monks also have other roles which are very important for social development. To summarize, the meeting (5th National Health Assembly, Agenda 2.3, 18 November 2012: 1-7) proposed the roles of monks for social development as follows. 1) The role in economic development involves, for example, the promotion for growing plants or natural agriculture with complete cycle, feeding silk, growing water melons, feeding fish, feeding pigs, establishing groups such as groups for gems cutting, rice bank, saving trust, and village cremation. 2) The role in social development involves being good models of behaviors and conducts, and leaders of community development such as building roads within the community, setting rules for house fences, cleaning canals, developing running water systems, and building containers for keeping rain water. These activities need cooperation between temples, villagers and government agencies. 3) The role in educational development involves many aspects, for example, providing education to the monks, looking after their well being and physical and biological environment, establishing educational parks and libraries within temples, and organizing training for career development. 4) The role in health development involves, for example, providing assistance to people by using traditional herbs for general, orthopedic, and drug addiction treatments. The important role is that the promotion of mental health including the prevention and recommendations of mental health problems, and rehabilitation of patients with chronic mental illness and drug addiction. 5) The role in environmental development involves, for example, arranging shaded and green areas within temples to relieve the sadness of people who are unhappy, being leaders in environmental development in community, and organizing training for youths in environmental conservation. This role agreed with the study of Veeravatnanond (1998) which mentioned about the roles of monks concerning the conservation and development of environmental quality. They were, for example, 1) the role in providing education and training about environmental conservation, and 2) the role in the environmental development.

From the above discussion, another role is that temples should be good models for religious ceremonies. The ceremonies with the traditional practices from the past may cause luxury and expenses. They are not linked with the knowledge and understanding about nature, but cause problems instead. Temples should be good models for the improvement of those ceremonies appropriate to the incomes of people as well as the condition of natural resources which have been gradually reduced and destroyed. The improvement of ceremonies or the cultural changes of society will lead to suitable ways of life, good values, and effective protection of environmental destruction.

To conclude, all factors and indicators of environmental management for temples gained from this development have linked people sector with temples. These parties must cooperate in encouraging and supporting each other in order to lead temples and communities to the holistic creation of environment within the temples. The environmental management will be able to facilitate the religious ceremonies and to promote good mental health which is the basis of good behaviors and conducts in society at present and also in the future. Therefore, the factors and indicators of environmental management for temples obtained from this development are not new things or tasks for monks and people. They are those old tasks used for teaching people and also tasks that people have to do with temples. These two parties must support each other. This action will bring good benefits toward the development of environmental quality within temples through the real involvement of all sectors of the community.

IV. Recommendations

a) The Implementations of Factors and Indicators of Environmental Management For Temples

The factors and indicators of environmental management for temples were obtained in this study and development by using the participatory process from all sectors. The mutual point of development followed the holistic approach in which all factors and indicators were related. The development of a factor and an indicator absolutely affected other factors or indicators. This environmental development within temples through the use of factors and indicators obtained from the mutual agreements was then quite difficult for all temples to proceed to achieve all criteria determined due to various reasons. They depended upon, for example, the readiness of budget, area, community to provide supports, and many others. Thus, the development of temples according to all factors takes time to operate.

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Therefore the development of environment within the temples should start from the management of environment in the temples with the factor that the temples have potentials to do first and upon the context of each temple. This is made at least to start the operations for promoting the pleasant environment within temples, to be useful for both the monks and people who come to get benefits in the temples, and to inspire the environmental management with the temples as the center of the development.

b) General Recommendation

The information gained from the research will be very useful directly toward the monks and people who come to the temples in terms of mental and physical conditions and also peacefulness. Thus, the development of temples must be based on the holistic principles and not only focused on any area in particular. The development must be gradually carried out. All factors of environmental management for temples must be developed. Especially, the development must get involvements of the local administrative organizations, government agencies, associations, foundations, and private sectors in order to promote and support the temples located both in urban and rural communities to have their own environmental management appropriate to the context of each temple as much as possible.

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Susceptible Development: Impact of Coal Mining on Environment in India

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Abstract- Coal mining contributes largely towards economic development of the nation like India although it has a great impact upon the human health. It also has its impact on socio-cultural aspect of the workers and people residing in and around coal mining areas. Thus a holistic approach for taking up to mining activities, keeping in mind concerns for adjoining habitats and ecosystem, is the need of the hour. This requires identification of various sites where minerals exist and various factors ranging from appropriate angle of slope of overburden dumps, safe disposal drains, and safe techniques to various silt control structures etc. In India Coal companies are now working towards "clean coal" strategies, which aim to reduce environmental impacts.

Keywords: *pollution, coal mining, development, displacement, global warming.*

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Susceptible Development: Impact of Coal Mining on Environment in India

Dr. Sribas Goswami

Abstract- Coal mining contributes largely towards economic development of the nation like India although it has a great impact upon the human health. It also has its impact on socio-cultural aspect of the workers and people residing in and around coal mining areas. Thus a holistic approach for taking up to mining activities, keeping in mind concerns for adjoining habitats and ecosystem, is the need of the hour. This requires identification of various sites where minerals exist and various factors ranging from appropriate angle of slope of overburden dumps, safe disposal drains, and safe techniques to various silt control structures etc. In India Coal companies are now working towards "clean coal" strategies, which aim to reduce environmental impacts. The reduced ash contents of the washed coal increase the thermal efficiency of combustion, which in turn make a direct impact on reducing emission of pollutants. However the coal washing requires extra water and it can turn towards a pollution free society. Coal is mined by two main methods- Surface or 'opencast' and underground mining method. Geological condition determines the method of mining. Coal mining is usually associated with degradation of natural resources and destruction of habitat. This causes invasive species to occupy the area, thus posing a threat to biodiversity. Huge quantities of waste material are produced by several mining activities in the coal mining region. If proper care is not taken for waste disposal, mining degrades the environment. The method of waste disposal affects land, water and air and in turns the quality of life of the people in the adjacent areas. This paper tries to focus on the various issues of environmental pollutions in mining areas.

Keywords: pollution, coal mining, development, displacement, global warming.

I. Introduction

Coal mining contributes largely towards economic development in India although it has a great impact upon the human health. It also has its impact on socio-cultural aspect of the workers and people residing in and around coal mining areas. Thus a holistic approach for taking up to mining activities, keeping in mind concerns for adjoining habitats and ecosystem, is the need of the hour. This requires identification of various sites where minerals exist and various factors ranging from appropriate angle of slope of overburden dumps, safe disposal drains, and safe techniques to various silt control structures etc. In India Coal companies are now working towards "clean coal" strategies, which aim to reduce environmental impacts. The reduced ash contents of the washed coal increase the thermal efficiency of combustion, which in turn make a direct impact on reducing emission of pollutants. However the coal washing requires extra water and it can turn towards a pollution free society.

Burning of coal, releases harmful substances such as sulphur dioxide, nitrogen oxides, carbon dioxide, particulates dust and ash. Dangerous levels of air and water pollution have been recorded in coal burning areas. It is globally accepted that coal mining adversely affects local and global environment. Mining adversely affects local environment in that it destroys vegetation, causes extensive soil erosion and alters microbial communities. Although coal mining does affect global environment through release of coal- bed methane, which is about 30 times as powerful as greenhouse gas as carbon dioxide. Coal mining thus adversely impacts on air quality standards. Underground mining causes depletion of groundwater at some places, as well as subsidence etc. resulting in degradation of soil and land. Subsidence of the soil beyond permissible limits requires filling of the subsidence area. The displacement and resettlement of affected people including change in culture, heritage and related features, criminal and other illicit activities on account of sudden economic development of the area can be said to be the adverse social and cultural impact.

Some of the beneficial impacts of mining projects are changes in employment pattern and income opportunity, infrastructural change and community development. Development in communication, transport, educational system, commerce, recreation and medical facilities etc. are some positive impacts. It is thus clear that coal mining leads to environmental damage, while economic development and self-reliance call for the increased mining activities of the available mineral resources. Though there is no alternative to the site of mining operations, options as to the location and technology of processing can really minimize the damage to the environment.

In this way coal mining has multi-dimensional impacts on environment directly or indirectly. The present work will be an attempt to bring into focus the impact of coal mining an environment in the Raniganj coal field region which is the command area of Eastern Coal field limited (ECL) and in the Jharia field region

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which is command area of Bharat Cocking coal limited (BCCL). Both are subsidiaries of Coal India limited.

II. Objectives of the Study

1. To find out the impact of coal mining on environment in Raniganj and Jharia coalfield.
2. To find out the various components of the environment related with the coal mining projects.
3. To elucidate the coal mining practice in Raniganj and Jharia coalfield.
4. To analyze the various proximate factors influencing the coal mining projects.
5. To find out the relation between the environmental condition and coal mining projects.
6. To discuss the causes and consequences of environmental degradation in the Raniganj and Jharia coalfield.
7. To discuss the various socio-economic infrastructure and environmental factors influencing the coal mining projects.
8. 8. To review the performance of Government programmes related to the coal mining Projects.
9. To highlight the policies of the coal India limited having direct bearing on Environment.
10. To observe the application of clean coal technology in various coalmines of Raniganj and Jharia.

III. Sources of Data & Methodology

The methodology of the research includes collection of research materials by field study and observation methods. The present study is based on both Primary and Secondary.

a) Primary Data

Primary data collected from:

a. *Field study:* Field study through observation method and interrogation with Management and laborers of the several collieries.
b. *Documentary facts:* Collection of day-by-day recorded information from Coal Mining Authority and unpublished information materials gathered from the office of coal mines.
c. Observation of the present condition of the several collieries during field study and also observation of coal mines (underground and opencast).

b) Secondary Data

The study mainly based on secondary data, collected from various sources like Economic and Statistical Department of E.C.L headquarters for all the Colliery related data like the manpower of concerned colliery, depth of the underground mines, location of opencast mines, record of accidents, etc.

c) Study Area

One of the important coalfield in India as well as of West Bengal, namely Raniganj coalfield has been selected for research purpose. The Raniganj coal field is bounded by latitudes 23° 35° N to 23° 55° N and longitudes 86° 45° E to 87° 20° E is the most important coalfield of West Bengal (Burdwan District) lies in the Damodar valley region is surrounded by Durgapur – Asansol Industrial belt. For empirical study, another study area of Jharkhand namely, Jharia coalfield has been selected for research purpose. The Jharia coalfield is located in the Dhanbad district of Jharkhand state at a distance of 260 km from Kolkata towards Delhi. It is bounded by latitudes 23° 38° N to 23° 52° N and longitudes 86° 08° E to 86° 29° E.

IV. A Brief Description of Raniganj and Jharia Coal Field

The total geographical area covers by both the coalfield is approximate 2300 square kilometers out of which Raniganj coal field comprises of 1630 km2 and Jharia coal field comprises of 670 km2 areas. As per the district statistical report (2010) the total population of the two coal mining belt was 6,65,300 out of the total population the working population in coal mines was 1,92,358 (C.I.L report 2010).

V. Area Wise Distribution of Mines of E.C.L. and B.C.C.L

There are total 14 area offices are present in Raniganj coal field (E.C.L) and under the area offices there are 124 collieries are coal producing unit. There are total 11 area offices are present in the Jharia coal field (B.C.C.L) and under the area offices there are 116 Collieries are coal producing Unit. List of the area Offices are given below:

Table 1 : Name of the Area Offices in E.C.L & B.C.C.L

Sl. No.	Raniganj Coal Field (E.C.L)	Jharia Coal Field (B.C.C.L)
1.	Rajmahal	Mahuda
2.	Sonepur Bazari	Barora
3.	Satgram	Govindpur
4.	Sripur	Katras
5.	Jhanjhra	Sijua
6.	Kunustaria	Kusunda
7.	Salanpur	Put ki bolihari

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8.	Mugma	Kostare
9.	Kajora	Bostatola
10.	Sodepur	Lodhna – Amlabad (E.Jharia Area)
11.	Bankola	Chanch Victoria (Block L and G)
12.	Pandeshwar	
13.	Kenda	
14.	Chitra	

Source : ANGARA, a Monthly Journal of IICM, Ranchi, May 2012.

VI. Employment in Coal India Limited (Including E.C.L. & B.C.C.L)

It is observed that particularly in the employment scenario of E.C.L. and B.C.C.L. it will be clear that after the nationalization of coal mines the number of employment in coal mines gradually increased. But in present the number of employment is decreasing due to several causes. In the following table the number of working population of the C.I.L is given.

Table 2 : Manpower in Coal India Limited

Company / Subsidiary of CIL	Manpower (01-04-10)	Manpower (01.03.11)
E.C.L.	94943	90758
B.C.C.L	80051	76576
C.C.L	58808	56698
W.C.L	64160	62545
S.E.C.L	82782	81597
N.C.L.	16697	16467
N.E.C.	3072	2971
CMPDI	3048	3062
D.C.C.	641	622
C.I.L. (HQ)	1089	1069
Total	405291	392365

Source: ANGARA, a Monthly Journal of IICM, Ranchi, May 2012.

VII. Site Development and Land Use Plan in Ming Areas in India

A site development and land use plan should be prepared to encompass pre-operational, operational and post-operational phases of a mine. It should clearly indicate the planned post-operational land use of the area, with details of the measures required to achieve the intended purpose. The general survey for the purpose must take into account not only the broad features of the actual or proposed mining operations, nut also the surrounding terrain conditions. The important components of this survey include:

(i) present land use pattern of the area;
(ii) main features of the human settlements in the area;
(iii) characteristics of the local eco-system;
(iv) climate of the area;

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(v) relevant terrain information that will help in waste dumping, tailings disposal, etc., with least effects on the local land-water system, including-
  (a) geo-morphological analysis (topography and drainage pattern),
  (b) Geological analysis (structural features-faults, joints, fractures, etc.),
  (c) Hydro-geological analysis (disposition of permeable formations, surface-ground water links, hydraulic parameters, etc.),
  (d) analysis of the natural soil and water to assess pollutant absorption capacity, and
  (e) availability and distribution of top-soil;
(vi) communication and transport facilities;
(vii) details concerning the mining plans-
  (a) minerals to be worked,
  (b) method of working,
  (c) details of fixed plants,
  (d) nature and quantity of wastes and disposal facilities required for them,
  (e) possibilities of subsidence and landslides,
  (f) transport facilities needed, and
  (g) Services to be installed.

An action plan for minimizing the adverse environmental impact from the proposed mining activity should be prepared. This shall also include rehabilitation of the mining area. The important aspects to be considered are:

a) Pre-Operational Phase

(i) Vegetation barriers should be raised along the contours in the hilly areas for the prevention of soil erosion and for arresting the mine wash.
(ii) Steps should be taken to construct check dams, either of rubble or brush wood, across small gullies and streams on the ore body to contain soil wash. The check dams shall be stabilized by vegetation.
(iii) The banks of streams in the mining are should be intensively vegetated to prevent the discharge of sediments into the streams.

b) Operational Phase

(i) For opencast mines, screens or banks of soil and overburden shall be constructed in the peripheral area.
(ii) Vegetation barriers shall also be constructed along the periphery of a mining area on either side of the mine/service roads and between other locations. The advantages include top-soil preservation, lessening of adverse visual impact, noise-baffling, dust suppression, etc.
(i) Clearance of vegetation should be restricted to the minimum necessary for mining operations, and planned in advance.

c) Post-Operational Phase

Once the mining operations are over, the land should be rehabilitated for productive uses like agriculture, forestry, pasturage, pisciculture, recreation, wild life habitats and sanctuaries.

VIII. Drilling and Blasting (Noise Pollution)

a) Noise Pollution In Raniganj And Jharia Coal Mines

The noise is now being recognized as a major health hazard; resulting in annoyance. Partial hearing loss and even permanent damage to the inner ear is noticed after prolonged exposure. The problem underground is of special importance because of the acoustics of the confined space. The ambient noise level of the underground mining area is affected by the operation of the cutting machines, tub/conveyor movement and blasting of the coal. The movement of coaling machines and transport units-conveyor, tubs and transfer points caused audible noise which becomes disturbing underground because of the poor absorption by the walls.

b) Noise Pollution Due To Mining Activities

The most note generating equipment underground are the haulage, ventilators-main, auxiliary and forcing fans, conveyor transfer points, cutting and drilling machines. The ambient noise level due to different operations in underground mines varies within 80-1040 dB(A). In a mine of Raniganj and Jharia the noise level near fan house, conveyor system shearer and road headers was reported to be within 92-93 dB (A). The values increased in many Indian mines because of poor maintenance of the machines and exceeded the permissible limit of 90 dB (A) for 8 hours per day exposure. The result of a noise survey for a coal mine conducted by DGMS (Director general of mines safety) is summarized in the following table which indicates noise over 90 dB by the drills, breaking and crushing units and transport system underground.

Table 3: Noise level in underground coal mines

Location of survey	Average Noise level dB (A)
Near shearer	96
Transfer point	99
Tail end belt conveyor	89
Power pack pump	91
Drive head of AFC	96

Sources: Coal Mining Planning and Design Institute, Survey Report, 2012

The mechanized mines have lower noise problem in comparison to the old conventional mines operational mines operating with haulage and coal

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cutting machines. The results (Table 3) covering wholly manual, partly mechanized with coal cutting machines and partly mechanized with SDL loading showed reduction in the noise level underground.

Table 4 : Noise survey in selected coal mines

Type of mine	Machine points	Noise Level	Duration of Operation
Wholly manual	Drill Tagger haulage	87dB(A) 105Db(A)	1-2 hrs 4 hrs
Mechanized with CCM cutting	CCM Drill Auxiliary fan	94Db(A) 94Db(A) 93dB(A)	1 hrs 1-2 hrs 8hrs
Mechanized loading	Drill LHD Chain conveyor	88Db(A) 98Db(A) 84Db(A)	2 hrs 4-5hrs 4-5hrs

Sources: Coal Mining Planning and Design Institute, Survey Report, 2012

c) Noise Pollution Due To Blasting

The blasting underground cause's high frequency sub audible noise measured in terms of air over pressure. The magnitude of air pressure is found to be 164 dB (1) at 30m distance reduced to 144 dB (l) at a distance of 70m. Test results of some of the sites are summarized in the following table.

Table 5 : Air pressure due to blasting in underground mining areas

Mine name	Explosive type	Max, charge/delay Total charge Max, (kg)		Air over pressure at Distance-m Value Db(l)	
Ray	P1	kg	10.6 kg	50m	153.8
Bachra	P5	6.2 kg	2.4 kg	70m	144.5
	P3	12.5 kg	12.5 kg	154m	150.1
Girmint	P5	6.4 kg	2.5 kg	30m	164.8

Sources: Coal Mining Planning and Design Institute, Survey Report, 2012

The total noise menace due to blasting underground is the result of the audible and sub audible noise. The sub audible noise responsible for vibration causes vibration of the surface features and in case of thin overburden cracks in surface structures. This societal reaction of Jharia Town Development Forum over blasting forced the pick mining in some of the situations. The reaction of blasting is reported in the following forms.

- Damage of old structures due to vibrations.
- Public nuisance vis-à-vis disturbance of sleep.
- Disturbance of sewerage and water supply line.

The amplitude of vibration due to blast wave was observed to be reduced with increase in the height of the building and hence drop in the level of nuisance in the upper floors. The investigation in some of the mines revealed that in case of machine cut the blasting in the lower section generated more vibration than that of the upper portion. The restriction of total charge was essential to minimize the vibration due to blasting underground. The P5 explosive generated low vibration in comparison to P3 grade of explosives.

The noise control measures in general are categorized in three groups: personal protective measures, engineering control measures and administrative measures. The engineering control measures are the most effective as they are based on sophisticated techniques like Retrofit approach for

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installation of noise control treatment on mining equipment. Designing of inherently quite mining equipment is also included in this technique which aims to control and reduce the noise emission successfully. The preferred cost effective system for the underground mining has been the personal protective system – ear muffs for the operator of the noise producing units.

IX. Toxic Waste Treatment

Nearly 25-35% of rain water drained back to ocean through reveres and streams; the major source of potable water for local population. Except particulate impurities (coal dust/soil/clay) and bacteriological or biological impurities; the river water was normally fit for consumption. Normal filtering and disinfectants made the water acceptable and had been used in India and elsewhere. Ground water on the other hand was not fit for consumption unless treated for hardness. The quality of mine water of Jharia and Raniganj Coalfield obtained from the underground mines are summarized in the following table.

Table 6 : Mine water quality in e.c.l & b.c.c.l

Area	**Kunustoria**	
Project	Parasea UGP	Effluent water(MOEF schedule-vi standard)
Qtrending	June 2009	
Samplining station	W1	
Date of sample	Mine discharge from pit no. 2	
Colour	9th May 2009	
Orour	unobjectionable	unobjectionable
TSS	unobjectionable	unobjectionable
PH	44.00	100.00
Temperature ^{o}c	8.40	5.50-9.00
Oil & grease	Normal	Shall not exceed 5^{0}C
Total residual chlorine	<1.00	10.00
Ammonical Nitrogen	Nil	1.00
Total kjeldahi nitrogen	0.03	50.00
Free ammonia	0.76	100.00
B.O.D.	BDL	5.00
C.O.D.	-	30.00
Arsenic	40.00	250.00
Lead	<0.01	0.20
H .Chromium	<0.05	0.10
Total Chromium	0.08	0.10
Copper	0.08	2.00
Zinc	0.05	3.00
Selenium	0.02	5.00
Nickel	<0.01	0.05
Fluoride	-	3.00
Dissolved phosphate	0.46	2.00
Sulphide	-	5.00
Phenolics	0.04	2.00
Maganease	<0.001	1.00
Iron	0.22	2.00
Nitrate nitrogen	0.18	3.00

Sources: Coal Mining Planning and Design Institute, Survey Report, 2012

Note: All parameters are in mg/l unless specified otherwise NA stands for not analyzed.

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Iron	0.22	2.00
Nitrate nitrogen	0.18	3.00

Sources: Coal Mining Planning and Design Institute, Survey Report, 2012
Note: All parameters are in mg/l unless specified otherwise NA stands for not analyzed.

The water pollution problem in the mining areas is broadly classified into the following major heads depending upon the nature of coal and dump, effluents and rock formation:

- Acid mine drainage in case of high sulfur coal
- Eutrophication and Deoxygenating due troth of algae because of sulfur.
- Heavy metal pollution

High level of dissolved solids such as bicarbonates, chlorides and sulfates of sodium calcium, magnesium, iron and manganese are introduced to water while passing through aquifuge and aquiclude made permeable due to sagging and industrial usage without treatment. This makes the water hard, unfit for drinking, other impurities in a few selected mines of Jharia and Raniganj coalfield. Low level nitrates and phosphates served as nutrients to algae; rapid growth of which caused deoxygenating of water, and lowering of dissolved oxygen. This was likely to occur when the underground water was accumulated in water pools. Use of such water for irrigation might improve production and yield of crop.

a) Acid Mine Drainage

Breaking of coal and leaching of pyrite of sulfur content from the coal and surrounding formation lead to acid mine drainage; a problem known world over. Oozing out of yellow sludge, smell of H2S and increase in pH value were some of the physical symptoms of the Acid Mine Drainage (AMD). The corrosion of impeller of the pumps, pitting or whole development in the steel pipes and loss of aquatic life were the other impacts of AMD. This problem was mainly in the North Eastern Coalfield of Assam, Arunachal Pradesh and Jammu & Kashmir and somewhere in Raniganj and Jharia coal field also.

Average sulfur content of the coal of Gondwana stage is below 1% which increased to as 8% in Jharia Coalfield; average being within 3.5%. The sulfur content of semi-anthracite deposits of Raniganj is even higher, up to 9%. The sulfur in coal deposits of this region is organic as well as pyretic in nature. The organic sulfur was structurally bound in coal and is difficult to separate, wash or drain. Pyretic sulfur on the other hand is present as intrusion in the coal seams and immediate formation around in form of balls –circular or elliptical mass or fine dispersed particles. These tiny particles were mainly responsible for the acid mine drainage. Crushed pillars, caved coal band, intrusive rocks and lift over coal dust were subjected to leaching when the aquifer or aquiclude drained down due to secondary permeability of the interburden. Under the influence of seeping water, the pyrite (Fe SO2) was oxidized, forming sulfuric acid. As a result, pH value of the water increased, making it unfit for normal consumption and industrial use.

a) Heavy Metal Pollution

Heavy metals like lead, zinc, arsenic and cadmium were detected in traces in the mine water, mainly because of leaching of aquifuge, aquiclude and igneous intrusions and effluent of oil and grease from the machines underground. The toxic substances generally in the confined state within the rock mass were exposed to dynamic setting of soil water system when they start polluting mine water. The list of the toxic elements and their impact is summarized as follows:

Table 7 : Toxic trace elements and their impact

Element	Impact/Effect
As	Toxic, possibly carcinogenic
Cd	Hypertension, kidney damage &
Be	toxic to biotic
B	Acute toxicity, possibly
Cu	carcinogenic
Fl	Toxic to plants
pH	Toxic to plants and algae
Mn	Cause mottled teeth Toxic (Anemia, Kidney disease, nervous disorder) Toxic to plants

Sources: Coal Mining Planning and Design Institute, Survey Report, 2012

Some of these elements served as nutrient to plants and aquatic life at lower concentration. There concentration in coal mine water was normally within permitted limit and required no special treatment. The survey result of two mines of Raniganj coalfield is summarized in the following table.

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Table 8 : micro elements in bonjemihary & GHANSHYAAM MINES

Micro elements Cmol (P+) kg	Benjemihary	Ghanshyaan
Ca	0.78	51.0
Fe	0.51	0.89
Al	0.49	0.68
Mn	0.09	0.14
Zn	0.11	0.08
Mo	0.02	0.02
Cu	0.02	0.005
Bu	0.02	0.02

Sources: Coal Mining Planning and Design Institute,Survey Report, 2012
*Results in ppm.

The presence of a large number of trace elements in coal was attributed to species of carbonaceous swamps or contemporaneous sedimentation with holmic acids solubilizing and binding these elements. Trace elements might have come through inflowing these element might have come through inflowing ground water during calcification. The magma tic and fluid might have resulted epigenetic mineralization and enrichment of trace metals. The elements like. As, Cd, Hg, Pb and Zn were the inorganic fraction of coal while Cr, Cu and Sb were present in mineral and organic from. The concentration of trace elements in Raniganj and Jharia coalfield is summarized below.

In the process of mining these elements were released or mixed to the inflowing water and ultimately to water channel.

Table 9 : Concentrations of trace elements in coal

Element	Concentration (µg / g^{-1}) of Trace Elements in Regions			
	Kunustoria	Parasia	Katras	Victoria
Antimony	1.35	-	3.5	3.33
Arsenic	14.9	4.8	6.8	16.8
Cadmium	2.89	0.2	-	0.2
Chromium	14.1	12.7	17.5	31.9
Fluorine	59.3	54.0	-	-
Lead	39.8	0.8	-	21.7
Mercury	0.21	0.07	0.42	0.22
Barium	113.8	146.0	-	21.7
Nickel	22.4	5.5	-	-

Sources: Coal Mining Planning and Design Institute, Survey Report, 2012.

b) Water Regime Disturbance

Disturbance of lithosphere, yield and movement of ground water, dewatering of the workings and recharging of overburden formation were the interrelated operation of underground mining. Dewatering from underground, recharging from rainwater precipitation and inflow of surface water were complimentary to each other. With the formation of depression fissures, even the aquifuge started draining across and cone of depression extended for and wide out of the area of influence.

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Settlement of the ground with water drainage induced additional cracks and fissures over the surface. As a result, the rate of precipitation increased when higher percentage of rain and surface water infiltrated down ward; raising overall water table. Furthermore, in place of a few confined aquifers, extensive unconfined/ leaky aquifers were formed with the ground movement.

The water starting from precipitation traveled overland, adopted through flow, interflow and base flow leading to basin channel flow and a part retained in aquifers. With the creation of voids underground; percolation through mine roof and walls and ultimately flow with the failure of confining beds occur. The water accumulated in the mine is pumped back to surface. Mine water pumped from the working face contained 1500-1600 mg/1 suspended impurities, mainly coal dust, particles and salts of calcium, magnesium and iron. The concentration of suspended impurities dropped slowly in sumps formed underground. With the filling of cracks by silts or clay particles during rainy season, the overburden character was restored with time when water pools were formed on the surface in the subsidence trough and given opportunity, flora and fauna congenial to climate and surroundings developed with better result. On the other hand, undulation of ground disturbed the channel of streams or rivers, bringing larger area under high flood level of the streams. Unless taken care, the river water flowed down through fracture planes, flooding the working. Depending upon thickness of the burden and the working seams, the fractures became open channel or was sealed with silting. Loss of stream or formation of water pool was the two extremes of the phenomena.

Quality of water, however, was the main casualty of the scenario when hardness of the water increased up to 700 mg/l inclusive of 300-500 mg/l permanent hardness which necessitated special treatment. The other impurities like heavy metals and oxygen balance of the underground water in most of the Indian coalfields were well within the accepted limit.

The ground movement impact on hydrosphere was manifested in the form of increased storage and charging character, lowering and disturbance of the water table, loss of streams or water pools. Some of them improved the water availability to the flora and fauna and biomass in general and improved the environment and ecology while a few caused temporary damage to the environment and ecology with the development of the fracture planes and opening of the cracks. The positive impact of the ground movement over the hydraulic regime was however, diluted due to repeated mining of the seams one after the other. With each seam working, the cycle of negative impact was repeated, water table lowered and level of pollution increased time and again. It takes time – a couple of years again before the regime were restored to normalcy.

c) Illegal Coal Mining

Coal occurs so close to the surface in many areas of Raniganj and Jharia Coal field, particularly in the context of a stagnant agricultural sector, to dig it out is irresistible. Any tool is used for this purpose-mostly ranging in variety and complexity from the traditional ones to comparatively more efficient, modern equipment. A near vertical hole on the ground leads to a labyrinth of tunnels which are sometimes only high enough to hold a squatting man. These rat-holes may occur anywhere in the region and have opened up a new, albeit illegal, avenue of informal employment. Many abandoned uneconomic mines of ECL- and BCCL both underground and opencast are also thriving as illegal mining sites.

Thus mines have often been called 'state run private enterprises' as few adequate steps have been taken to curb the malpractice. These mines have become sheer death traps where unplanned coal exploitation and subsequent roof falls result in loss of lives of many illegal mines, most of which go unreported. Illegal Mining is a common feature in most of the coal mining areas. In Raniganj and Jharia coal mines region it is not an exception. In these regions the young unemployed persons are generally engaged in illegal coal mining.

According to the author, Illegal Mining can be defined as, "Unethical and illogical cutting of coal seams beneath the earth surface without the prior permission of the coal mining authority". In the coal bearing land it is the easiest way to earn some money rapidly. In this process many big holes are made on the earth surface like a 'rat-hole' to cat the shallow coal seams. Another process is cutting the coal seams from the abandoned mines, Illegal miners are simply dugout the coal seams and sell the huge amount of coal in the local market through 'Coal Mafia' and earn a healthy price. The author has visited many places of Raniganj and Jharia coal mining belt to observe the illegal mining process. Local police authority is not in sound to protect the illegal mining process. A healthy amount is always goes to their pocket and they are mute listeners in this care.

X. Some Negative Impacts of Illegal Mining on Environment

1. In this process of mining there are unscientific cutting of shallow coal seams, which often causes disorder in the surface of the mining region.
2. This type of mining causes huge removal of top soil and it causes soil erosion.
3. Where the mining activities are going on there is total destruction of vegetation cover in that region.
4. Due to illegal mining there is a massive dust and noise pollution occurred in the surrounding area.

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5. Due to unscientific cutting of coal seam there is a destruction of coal reserve in coal mining belt.
6. Due to illegal mining there is always chance of land subsidence.
7. Due to mismanagement and natural heating sometimes fires may cause in illegal mines, which results into huge emission of noxious gases and burning of Coal seams.
8. After cutting of coal seams illegal miners left all the mines in the lap of nature. So, the whole region is converted into an abandoned field.

XI. Illegal Coal Business in Raniganj and Jharia Coalfield

There is no proper legal documentary facts or data are available related to illegal coal mining business, but as per some personal survey and confidential report there is maximum transaction of illegal coal must be exceed Rs.8 billion per annum. Out of this huge amount the business of Rs.3.50 billion comes from CCL and Rs.4.50 billion comes from ECL and BCCL area.

According to some sources, the free trade of illegal coal occurs in a massive way in RCF and JCF region. Per day approximate 500 truck of coal are dispatched to hard coke, sponge iron factories, brick industries and different part of the country. It is estimated that, per day 300 trucks of coal from Dhanbad region and 200 truck of coal from Jharia, Raniganj and Bokaro region dispatched to the market.

The quantity of coal per truck is 20 tons and the price of this amount of coal is Rs. 60,000 per truck. In this way the business of illegal coal is approximate more than Rs.3 billion per day. In this coal mining region the illegal coal business continues up to 9 months in a year. During these 9 months approximate 1.35 million truck coal is extracted from illegal mines. The total amount of coal business continues up to Rs .8 billion in a year.

Per day illegal coal production-500 truck (per truck 20 tons)

Coal production in 9 months-500 × 270= 1.35 million truck

In market value of per truck coal- Rs.60, 000

Per annum business of illegal coal-1.35 million truck × 60,000=8.10 billion

Fixed amount from 1 truck coal:

Value of coal-20,000 Rs.

Police-10,000 Rs.

Terrorists-5,000-6.000 Rs.

Fare of truck-15,000-20,000 Rs.

Amount of the coal marchent-5,000-10,000 Rs.

Many local people also engaged in this illegal coal business. Generally they are supported by local coal mafia and local police authority. Local people use their bi-cycle, bullock-cart, rickshaw-van etc. to dispatch by illegal coal to local market. In this way they earned a healthy price from this illegal business. Many complains are made to the local police station to stop Illegal coal mining by the local people .But the police authority is sleeping in this matter.

a) The Region Of Illegal Mining

Jharia region- Mohuda, Bhatdih, Murlidih, Gobindpur, Tetulia, Katras, Kusunda, Kustaur, Lodhna, Mourigram, Sudamdih etc.

Raniganj region- Jamuria, Mejia, Satgram, Sripur, Sonepur bazari, Mahavir colliery, Kunustoria area etc.

b) Laws To Curb Illegal Mining

In order to curb illegal mining and rampant smuggling of major minerals, the state government has formulated Jharkhand Minerals Dealers' Rules (JMDR-2007) to check the menace.

The state cabinet while approving the Mineral Dealers' Rules-2007 strongly felt that the there are a large number of dealers operating without any proper record or registration with the mines and minerals department. Hence the government decided to make the registration of operating dealers mandatory with the department concerned. This will put a spanner on illegal marketing and smuggling of major minerals like iron ore, bauxite etc, said the secretary, mines, Jaishankar Tiwary. The state government he said is unable to cross check the minerals stocked or stored at any place.

Those dealing in minerals had the plea that they paid off the royalty at the mining site and have stored the stock at some other place for transportation. The government also felt the need of cross checking and verification of minerals, as there is no provision available under the Central Government Mines and Minerals Development Act (MMDR), 1957.

However, the Centre has given ample scope to prepare the rule as per its requirement for checking and verification of account. With the new rule, JMDR-2007 to be brought into effect soon, the mines and minerals department will be able to verify the stock at any given point of time.

Officials said once the registration of the dealers is done, the department concerned will issue the license to the party. After this, the party will be able to purchase and stock the major minerals. The modus operandi also includes the dispatch receipt from the district mining officer (DMO) from the place of transportation of the minerals. According to the director, mines, B.B. Singh, illegal mining in the state is wide spread, thereby causing huge losses running in several cores to the state exchequer. The department is flooded with such complaints and the target of revenue collection of the department is difficult to achieve.

Hence the legal wing of the department thought it necessary to formulate the rule to put a check on smuggling of major minerals.

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XII. Concluding Observations

Mining has a significant impact on the economic, social and environmental fabric of adjoining areas. Although mining activities bring about economic development in the area at the same time the land degradation it causes creates ecological and socio-economic problems.

Mining adversely affects the eco-system as a whole. It is important to conduct suitable assessment studies to learn the potential adverse impact of mining or flora and fauna. The adverse impact should be identified at the planning stage itself so that corrective measures may be taken in advance.

To overcome from the problems one should have knowledge about the various activities of environmental concern. Every mine manager should keep a check list giving information on environmental controls, as envisaged in various mining lease conditions of the Government of India and Environment management plan. Frequent review of this information may enable identification of the site-specific environmental issues at the mine. Poor environmental performance may accelerate the demands for mere stringent regulatory conditions. The adverse effects of subsidence fissures have made most of the subsided areas barren and unstable. The indirect effect of subsidence has contributed to drying up of many tanks and dug wells in the vicinity. Much of these subsided land may however be put back to productive use with joint effort from coal companies and local bodies, but no concerted and coherent effort has however been taken in this direction. Not much study has been done towards reclamation of subsided land in Indian coalfields. In a few areas of Raniganj coalfield including Ninga and Sripur, plantation on subsided land has been tried. The scientists are of the opinion that before starting reclamation of subsided land, the purpose of reclamation in terms of "land-use" should be decided in consultation with the local people. The most important thing is to plug the cracks and it may not be necessary to bring the subsided land to original profile even for use for agriculture, plantation and housing. Some researchers are, however, badly needed for improving water retaining capacity of subsoil in the subsided land. There is no specific legislation in India concerning subsidence, but as per common law, the coal company is to acquire the surface right of the property in which subsidence may occur due to underground mining. In some countries, there are specific legislation guiding the coal industry in matters of subsidence and perhaps such enactment may be the necessity of the day in our country also.

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On Investigation an Assessment of Social Life of Dehdasht City Quarters using ELECTRE Model

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Abstract- Capabilities and facilities in urban areas have developed through the past of several years. The appearance of these capabilities and facilities has come out through the cost of financial, human and environmental. Mere attention to physical, skeletal and population and ignorance social factors in many of the previous studies has caused the failure of them. The purpose of the present study is assessment of the social capacity of Dehdasht city quarters. The method of the study is analytical-scale and has been conducted according to documentary and library research.

Keywords: *community, social and environmental capacity, dehdasht, electre model.*

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On Investigation an Assessment of Social Life of Dehdasht City Quarters using ELECTRE Model

Gh.A. Khammar [α], A Kiani [σ], A. Ashkbos [ρ] & N. Mansourzadeh [ω]

Abstract- Capabilities and facilities in urban areas have developed through the past of several years. The appearance of these capabilities and facilities has come out through the cost of financial, human and environmental. Mere attention to physical, skeletal and population and ignorance social factors in many of the previous studies has caused the failure of them. The purpose of the present study is assessment of the social capacity of Dehdasht city quarters. The method of the study is analytical-scale and has been conducted according to documentary and library research. The data and information include related features and criteria according to assessment of the capability and capacity of social life in Dehdasht city quarters like identity and place belonging, cooperation, security, dynamicity and vitality, variety and social diversity and increasing the density through the model of ELECTRE. According to the purpose of the research winch is the assessment and selection of the best quarter, four quarters were chosen from different parts of the city. The results showed that the old quarters were superior than the other ones and this fact refers to vitality and dynamicity of life as the results of relationship among different neighbors and place belonging, residents cooperation in the quarter affairs and social variety in the construction of the old quarters. The other places were given to the approximate new, middle and new quarters which results from the lack of identity and lack of belonging in relation to the other quarters.

Keywords: community, social and environmental capacity, dehdasht, electre model.

I. Introduction

Today, the environmental quality of human life is deteriorating due to improper operation. Uncontrolled growth of cities limits access to the suitable, free places and providing services in the cities. The improper establishment of different Industries, water pollution, air pollution, noise pollution, visual and motor vehicle traffic have sped the process of environmental destruction and pollution. We can to these problems the population growth, lack of resources which have caused severe problems in human life. Quarter is a geographical, key and social place which includes interpersonal network and the individual relationship with the other residents of the quarter (Nooriyan and Rezaei, 2006, p. 36). According to Lynch city is composed of five elements, namely, road, nodes, landmarks, quarter and edge and he believes that the quarter is an extensive place which can be identified based on some common and special properties which everybody can understand and realize it mentally (Chappman.2007, p. 19). The quarter is defined in Iranians context as a residential body with capacity of 700-1250 neighborhood with the accessible radius of pedestrian (Habibi and Massaeli, 2007, p. 13). According to Ziari (2009, p. 40), the quarter has cultural element such as mosque and educational element such as elementary school.

In the past, there was not a sharp separation between the rich quarters and the poor ones, and the residents of quarters were from different people with various socio-economic status such as rich, middle class, scholar, trader and the other kinds of the existing professions in the society (Imani Jajarmi, 2007, p.19).

In fact, the trend of establishment of old quarters was in such a way that it was able to meet different individual and social needs of its residents, but changes in different factors such as economic, social, environmental and body of the cities in general, and in quarters especially, has had a negative impact on usability and capacity of quarters to meet different needs of its residents (Azizi, 2006, p. 36). According to Zarabi and Musavi (2009, p. 5), the development of small cities is an accepted way of spatial and economic growth and social balance.

In fact, rapid changes in in the spatial body of different citifies in recent decades, the rapids growth of urban population and uncontrolled growth of quarters which is based on economic framework have caused to prevent the participation of residents and has caused the quarters to be ineffective and improper for social life. Investigating the concept of quarter and its related effective factors need several comprehensive studies which some of them are discussed as following:

According to Rafiyan and et al, (2007), investigated the mental understanding of Jolfa quarter participants and concluded that the design of social public space is the main reason of people cooperation (p.55).

Feruzesh (2010) considers the quarter as the main productive element of the city and emphasizes that the proposal of the quarter bases model, which is based

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on people cooperation and participation on their daily life and affairs should be considered as an acceptable and suitable model in city planning and management (p. 10).

Franzini and et al (2005) have investigated the low-income quarters in Texas based on the characteristics of social and economic processes. Ellen and Orgean (2011), have investigated the process of changing conditions in low-incoming quarters (p.89). Flint (2009) studied the society and quarter and considered the quarter and society as different forms of human organizations which have some commonalities and are classified as urban residential areas (p. 354).

II. Research Question and Hypothesis

Question: do biosocial factors in various times of formation of Dehdasht city quarters (new, relatively new, middle and old) differ?

Hypothesis: Based on the long trend of formation of the old quarters of Dehdasht city the conditions of biosocial in theses quarters is superior to the other quarters.

Since the present study is based on the quarter research, a cluster sample method was employed in which among the eleven quarters from different parts of the city (old, middle, approximately new and new quarters) four quarters were chosen and investigated. In order to fill the questionnaire, based on the population of the city and general formula of Kuchran the rate of the sample was calculated as following (Hafeznia, 2008, p.167).

These questionnaires were distributed among the quarters based on the population of the city. Based on the given definitions and concepts and according to those principles suggested by Azizi and et.al for assessing the social features of quarters on one hand, and those principles related to assessing the life capacity of quarters on the other hand the following factors were chosen in order to complete the decision making matrix: dynamisms and lively as a result of communication between neighbors, security, participation, identity and belonging, social diversity and increasing in density.

III. Scope of Research

Dehdasht is the center of Kohgiluyeh district in Kohgiluyeh va Boyer Ahmad province south-west of Iran. Based on its population it has the third place in the province. The city of Dehdasht is located in a plain under the same name at the distance approximately 60 kilometers from Behbahan city Khuzestan province). Among the above mentioned plain, the Dehdasht city is located with geographical longtitude"50 ° 33 '12 and geographical latitude 30 ° 47' 41" and a height of 810 meters above sea level. In the plains, there are high mountains which the height of the highest one reaches to 2330m in Seyah Mountains (Rashidi Fard et al, 2011).

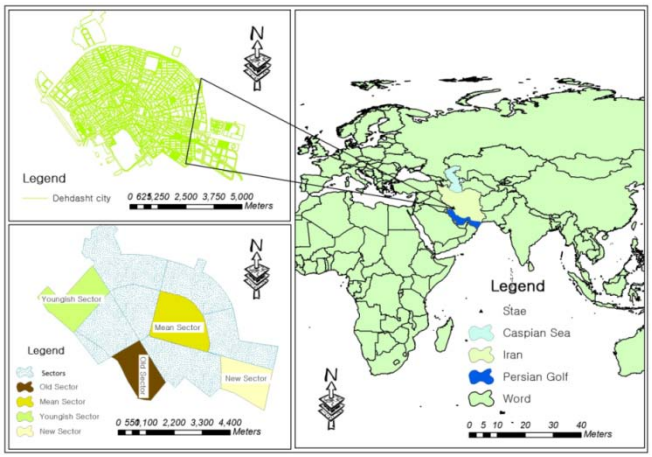


Figure 1 : The geographical setting of Dehdasht city (authors, 2013)

IV. Concepts and Definitions

a) Habitable space

The habitable space with a suitable quality for living is a section of new trend which considers the health of the quarters with different factors and its relation with density (Polentz, 2004, p. 3). The factors such as cooperation, control assessment of public factors and place belonging leads the environmental life to a livable place for all (Timmer and Seymour, 2006, pp. 4-6). On the other hand, Azizi (2006) considers the principles and criteria in sustaining of the quarters such as identity and vitality, dynamic, variety, accessibility, density and sustainable capacity of environment. He considers the issue of density in the capacity of quarter life and continues that understanding of low or high density in the quarters with various characteristics can be different. For example, in a calm, green and attractive quarter the density can be high apparently, but in the view of people and residents it may be considered as low density (Azizi, 2006: 39).

b) Electre Model

ELECTRE is a decision making model with several features which for the first time was considered as the best model in decision making in the late 1980s (Momeni, 2008, p. 30). Considering the usability of choices and coordinate and uncoordinated matrices classifies the options based on the preferences, this model has been applied for different purposes such as decision making for assessment the danger of greenhouse gases.(Brito, 2010, p. 815). This model has also been used for decision making in international conventions and functions (Almeida, 2007, p. 3516).

c) The analysis of the results

Considering the given features for assessing the suitability of quarters for living and the average of the results of the questionnaires, the characteristics and features show the following criteria:

results of the questionnaires, the characteristics and features show the following criteria:

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Table 1: Characteristics and social characteristics of neighborhoods

Indices / Sectors	Density increased	Identity and belonging locality	Dynamism and Liveliness	Participation	Security	Social diversity
New sector	Very low	low	low	Medium	High	low
Youngish sector	low	Medium	High	High	High	Medium
Mean sector	low	Medium	Medium	low	High	Medium
Old sector	Medium	Medium	High	Medium	Medium	Medium

Source: Authors, 2013.

The above-mentioned features which are qualitative are considered as very high, high, medium, low and very low. In order to assess theses qualitative features in a matrix, we should change them to quantitative features as following:

Table 2 : Quantitative Scoring Index

0	1	2	3	4	5	6	7	8	9
-	Very low	-	low	-	Medium	-	High	-	Very high

Source: Authors, 2013.

Based on these scales the qualitative criteria of measurement were changed into the quantitative criteria as shown in Table 3:

Table 3 : the evaluation and decision making matrix of the evaluated criteria by using the ELECTRE model Dehdasht city quarters

Indices / Sectors	Density increased	Identity and belonging locality	Dynamism and Liveliness	Participation	Security	Social diversity
New sector	1	2	3	5	7	3
Youngish sector	3	5	7	7	7	5
Mean sector	3	5	5	3	7	5
Old sector	5	5	7	5	5	5

Source: Authors, 2013.

After obtaining the quantitative matrix, for the sake of comparison of the scales of measurement, we should use a dimensionless scale by which different features can be compared easily.

Step one: the process of dimensionless of the matrix (N)

There are different ways for the process of dimensionless of decision making matrix, among them is the method of dimensionless of Norm. In this method, each element of the matrix is divided by the square sum of the squares of each column.

Relation 1:

$$n_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^{n} a^{2}{}_{ij}}}$$

Table 4 : The process of dimensionless of the assessment and decision making matrix using the Norm

Indices / Sectors	C_1	C_2	C_3	C_4	C_5	C_6	C_1	C_2	C_3	C_4	C_5	C_6
A_1	1	3	3	5	7	3	0/15	0/327	0/261	0/481	0/533	0/545
A_2	3	5	7	7	7	5	0/452	0/545	0/609	0/673	0/533	0/545
A_3	3	5	5	3	7	5	0/452	0/545	0/435	0/288	0/533	0/545
A_4	5	5	7	5	5	5	0/754	0/545	0/609	0/481	0/381	0/327

Source: Authors, 2013.

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The second step: obtaining the coordinate dimensionless matrix.

Every issue may have several features which its relative importance, is worth knowing. Accordingly, every feature is given a weight which theses weights identify the relative importance of every feature in relation to the other feature. For assessing the weights of theses feature according to Table (4) the Antropy method has been used.

Relation 2 :

$$P_{ij} = \frac{P_{ij}}{\sum_{i=1}^{n} a_{ij}}$$

Table 5 : Evaluation of the weights of the index

Indices / Sectors	C_1	C_2	C_3	C_4	C_5	C_6	C_1	C_2	C_3	C_4	C_5	C_6
A_1	1	3	3	5	7	3	0/083	0/166	0/136	0/25	0/269	0/166
A_2	3	5	7	7	7	5	0/25	0/277	0/318	0/35	0/269	0/277
A_3	3	5	5	3	7	5	0/25	0/277	0/227	0/15	0/269	0/277
A_4	5	5	7	5	5	5	0/416	0/277	0/318	0/25	0/192	0/277
	12	18	22	20	26	18						

Source: Authors, 201

Table 6 : Matrix of weighted scale

Indices / Sectors	C_1	C_2	C_3	C_4	C_5	C_6
Ej	0/616	0/984	0/963	0/969	0/992	0/984
dj	0/384	0/016	0/037	0/031	0/008	0/016
wj	0/78	0/032	0/075	0/063	0/016	0/032

Source: Authors, 2013.

In order to obtain the k value, we use the relation 3:

Relation 3 : $k = \frac{1}{\ln(m)}$

Relation 4 : $EJ = -K\sum_{i=1}^{n}[pij\ li\ pij]\ ,\forall_j$

Example: $E_3 = -0.721[0.318 \times \ln 0.318 + 0.227 \times \ln 0.227 + 0.318 \times \ln 0.318 + 0.136 \times \ln 0.136\ ] = 0.963$

Relation 5 : $d_{j=1-E_j}$

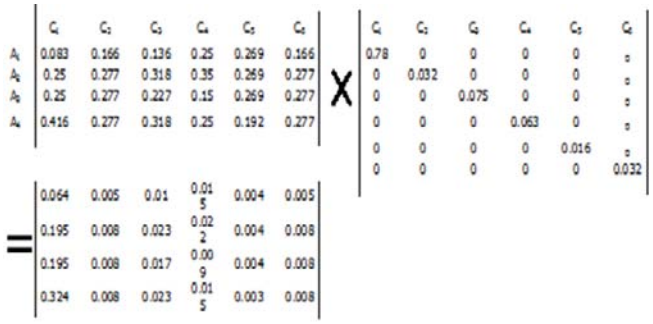
d 3 = 1 - 0 .963 = 0 .037

Relation 6 : $W_1 = \frac{d_j}{\sum_{j=1}^{n} dj}$ $\qquad W_3 = \frac{0.037}{0.496} = 0.075$

Now, based the relations 3, 4, 5, and 6 obtain the coordinate dimensionless matrix. For this purpose, the dimensionless matrix should be multiplied in square matrix (wn*n) which the main element of its radius are the weights of features and the other elements are zero the result is called the coordinate dimensionless matrix(V). We have shown this operation as following:

Relation 7 :

$$V = N \times w_{n\times n}$$



Step Four: Determine the coordinate matrix

This matrix is obtained according to the coordinate following relations:

Relation 8 : $I_{kl} = \sum W_j\ ,j\ \epsilon\ S_{kl}$

The criterion of Skl shows the relative importance of Sk in relation to St. the value of this criterion is digit between one and zero, and the more this value, it means its superiority of Sk in relation to St and vise versa.

According to this operation, for obtaining the preference of the first choice in relation to the second, we add the weights of the square matrix, and at the end we will have the following matrix

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$$I_{KL} = \begin{array}{c|cccc} A_1 & - & 0.016 & 0.079 & 0.079 \\ A_2 & 0.998 & - & 0.998 & 0.218 \\ A_3 & 0.218 & 0.86 & - & 0.08 \\ A_4 & 0.982 & 0.919 & 0.982 & - \end{array}$$

Step Five: Determine the uncoordinated matrix

In this stage the uncoordinated matrix is obtained according to V matrix with the use of the following formula:

Relation 9 :

$$NI_{ki} = \frac{\max \left| v_{kj} - v_{ij} \right|, j \in D_{ki}}{\max \left| v_{kj} - v_{ij} \right|, j \in \sum A}$$

This criterion, measures the unsuitability of the overall incoordination in features and uncoordinated I and k. the overall results of this matrix are as following:

$$I_{KL} = \begin{array}{c|cccc} A_1 & - & 1 & 1 & 1 \\ A_2 & 0 & - & 0 & 1 \\ A_3 & 0.046 & 0.046 & - & 1 \\ A_4 & 0.007 & 0.046 & 0.007 & - \end{array}$$

Step Six: Effective coordination matrix (H):

For establishing this matrix, we should have a low threshold greater than I and if each element of the matrix be one, and H equals to it, that element will be either one or zero in the matrix.

Relation 10: $\boldsymbol{I} = \frac{\text{جمع همه اعداد ماتریس هماهنگ}}{\text{مقادیر تعداد ماتریس}} = \frac{6.429}{12} = 0.535$

onsidering the obtained threshold, the larger values will be considered as one and the smaller ones as zero, so we have the following matrix:

$$I_{KL} = \begin{array}{c|cccc} A_1 & - & 0 & 0 & 0 \\ A_2 & 1 & - & 1 & 0 \\ A_3 & 1 & 1 & - & 0 \\ A_4 & 1 & 1 & 1 & - \end{array}$$

Step Seven: Effective inconsistent matrix (G)

Relation 11 : $\mathrm{NI} = \frac{\sum \mathrm{H}}{\sum \mathrm{N_h}} \rightarrow \mathrm{NI} = \frac{5.152}{12} = 0.429$

Since this is uncoordinated matrix, the smaller values than threshold which show the rate of incoordination with the whole of the complex are considered one and the larger values than the threshold value which show the coordination of the whole ccomplex are considered zero, so we have the following matrix.

$$I_{KL} = \begin{array}{c|cccc} A_1 & - & 1 & 1 & 1 \\ A_2 & 0 & - & 1 & 1 \\ A_3 & 0 & 1 & - & 1 \\ A_4 & 0 & 0 & 0 & - \end{array}$$

Eighth step: determining the overall matrix (F)

In this stage we combine the coordinate effective matrix with the uncoordinated effective matrix to form te general matrix, and based on the obtained matrix we have the following matrix:

$$I_{KL} = \begin{array}{c|cccc} A_1 & - & 0 & 0 & 0 \\ A_2 & 1 & - & 1 & 0 \\ A_3 & 0 & 1 & - & 0 \\ A_4 & 1 & 1 & 1 & - \end{array} = A_4 > A_2 > A_3 > A_1$$

V. Conclusion

The existing facilities and capacities in urban quarters have developed during the recent years. Absolutely, the appearance of these facilities and capacities has been facilitated through consumption of financial, human and environmental costs. Mere attention to physical, skeletal and population and ignoring the social factors in the past studies in these areas, have caused the failure of many of these studies and they have not been enforced successfully. The capacity of biosocial, or in the other words, the capacity to dwell the residents based on the social, economic, environmental and skeletal conditions in a given time and according to the trend in which the social life has been completed can distinct the quarters and different parts of the cities from each other. The appearance of mental security, the quality of life, the appearance of socio-cultural and cooperation centers are among the factors which have effect on the liveliness and happiness of the quarter residents.

In the present study, based on the dynamicity, importance of security, cooperation, identity and place belonging, the variety of the society and increase of density which were chosen as the factors for assessing the capacity of biosocial of Dehdasht city quarters based on the above- perspectives, four different quarters of in the old, middle and new parts of the city were studied. Based on the results and the process of data analysis, the old quarters with the total value of 3 in the coordinate matrix and inordinate effective matrix was the most harmonious social principles of life and has the capacity for residents to live with each other. The second place was given to the approximately new quarters with the total value of 2in the coordinate matrix and inordinate effective matrix which showed a better results in the field studies. The middle quarters with the value of 1 in coordinate matrix and 2 in inordinate was given the third place. Finally, the new quarters shoed a weak conditions regarding cooperation, place belonging, and the variety of social factors which necessitate the attendance of all the socio-economic levels in the quarters for variety and dynamicity was give the last rank.

Based on the obtained results, and unequal rank of the quarters according to bio-social factors, the hypothesis of the research tested and approved the long trend of formation of Dehdasht city old quarters and proved this fact that these quarters have high conditions for biosocial. It necessary to consider those factors which can be very effective in promoting the quality and conditions of the these quarters and try to

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improve their facilities to prepare them for life conditions like the old quarters.

Suggestions

In order to have a city with dynamic and secure quarters, the following principles and suggestions are proposed:

- Conducting comprehensive studies in order to know and identify the susceptible and suitable facilities based on the city divisions in the quarters of Dehdasht city.
- Doing more comprehensive studies in order to know borders of the new quarters to act based on new divisions and hierarchical principles.
- The low rate of vitality and dynamicity in the new quarters of Dehdasht city refers to this fact that these quarters are somehow new and need more facilities and careful planning to be more effective and prepared for life.
- Through a careful planning for social life in the quarters of Dehdasht city and considering the viewpoints of the quarter residents which pay attention to quarter as social body and try to involve the residents in the process of quarter management are the best strategies for improving the quality of life and increase the place belonging in the quarters of Dehdasht city.
- Regarding the low participation in the middle-body quarters of Dehdasht city, the ways of interaction cab be improved effectively through establishing the suitable public places, designing new recreational sites. These facts cause much participation and cooperation on the part of the quarter residents and increase their responsibility in the quarter affairs.

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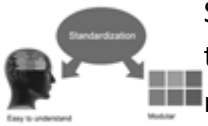


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3. Submission of Manuscripts,

4. Manuscript's Category,

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3. Think Like Evaluators: If you are in a confusion or getting demotivated that your paper will be accepted by evaluators or not, then think and try to evaluate your paper like an Evaluator. Try to understand that what an evaluator wants in your research paper and automatically you will have your answer.

4. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

5. Ask your Guides: If you are having any difficulty in your research, then do not hesitate to share your difficulty to your guide (if you have any). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work then ask the supervisor to help you with the alternative. He might also provide you the list of essential readings.

6. Use of computer is recommended: As you are doing research in the field of Computer Science, then this point is quite obvious.

7. Use right software: Always use good quality software packages. If you are not capable to judge good software then you can lose quality of your paper unknowingly. There are various software programs available to help you, which you can get through Internet.

8. Use the Internet for help: An excellent start for your paper can be by using the Google. It is an excellent search engine, where you can have your doubts resolved. You may also read some answers for the frequent question how to write my research paper or find model research paper. From the internet library you can download books. If you have all required books make important reading selecting and analyzing the specified information. Then put together research paper sketch out.

9. Use and get big pictures: Always use encyclopedias, Wikipedia to get pictures so that you can go into the depth.

10. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right! It is a good habit, which helps to not to lose your continuity. You should always use bookmarks while searching on Internet also, which will make your search easier.

11. Revise what you wrote: When you write anything, always read it, summarize it and then finalize it.

12. Make all efforts: Make all efforts to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in introduction, that what is the need of a particular research paper. Polish your work by good skill of writing and always give an evaluator, what he wants.

13. Have backups: When you are going to do any important thing like making research paper, you should always have backup copies of it either in your computer or in paper. This will help you to not to lose any of your important.

14. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several and unnecessary diagrams will degrade the quality of your paper by creating "hotchpotch." So always, try to make and include those diagrams, which are made by your own to improve readability and understandability of your paper.

15. Use of direct quotes: When you do research relevant to literature, history or current affairs then use of quotes become essential but if study is relevant to science then use of quotes is not preferable.

16. Use proper verb tense: Use proper verb tenses in your paper. Use past tense, to present those events that happened. Use present tense to indicate events that are going on. Use future tense to indicate future happening events. Use of improper and wrong tenses will confuse the evaluator. Avoid the sentences that are incomplete.

17. Never use online paper: If you are getting any paper on Internet, then never use it as your research paper because it might be possible that evaluator has already seen it or maybe it is outdated version.

18. Pick a good study spot: To do your research studies always try to pick a spot, which is quiet. Every spot is not for studies. Spot that suits you choose it and proceed further.

19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.



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27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

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Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
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- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

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The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
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- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
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Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.



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Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
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- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

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- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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